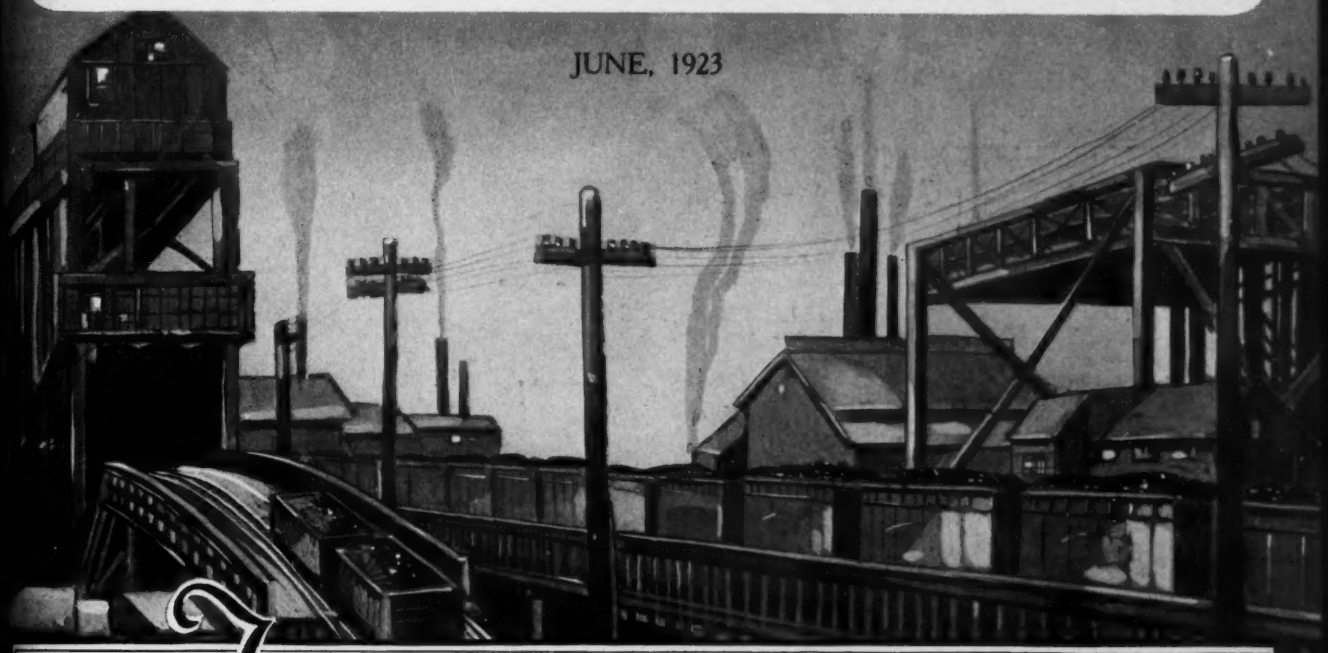
Railway Engineering and Maintenance

JUNE, 1923



RAILWAY ENGINEERING AND MAINTENANCE
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Alphabetical Index to Advertisements, Page 32 Classified Index to Advertisers, Pages 30 and 32

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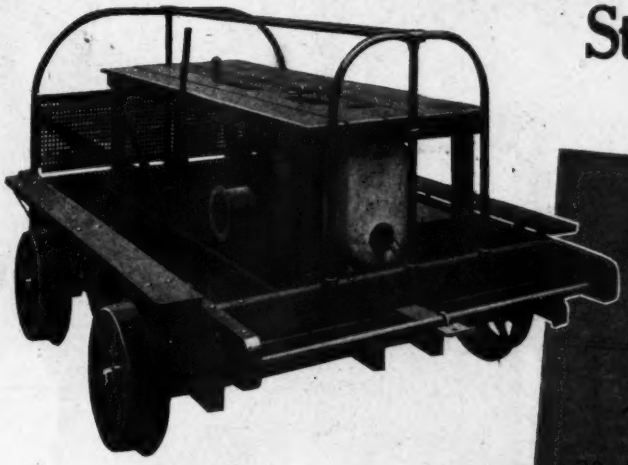

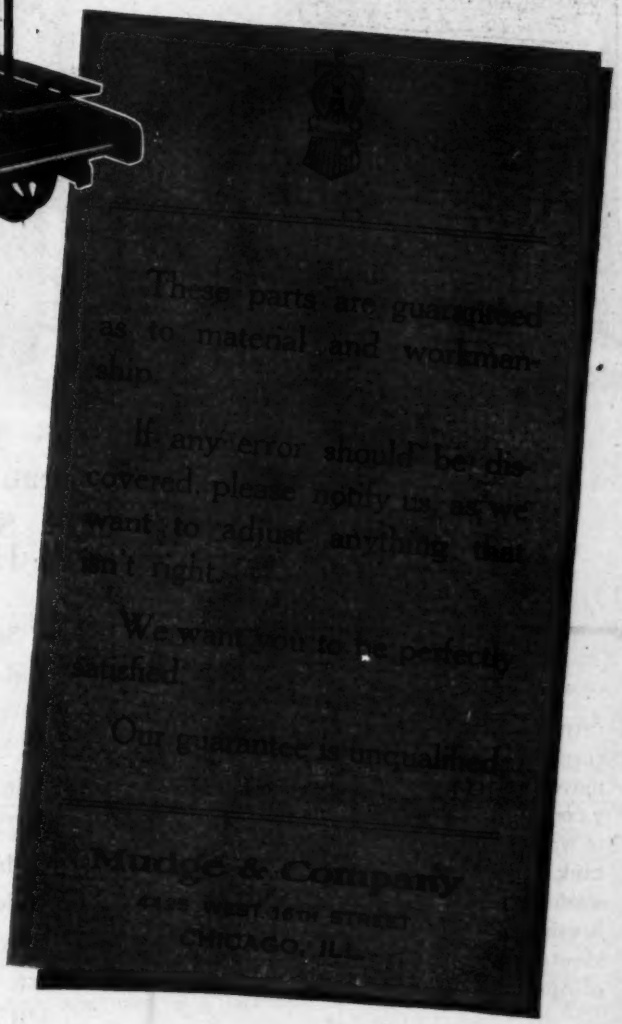

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Railway Engineering and Maintenance

Formerly the Railway Maintenance Engineer

Vol. 19 June, 1923 Number 6

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WOULD YOU LIKE TO KNOW

How to protect reinforcement in sea water concrete?

What advantage is gained by giving a rail gang undisputed use of a track?

How a hydraulic ram was used in a railroad installation?

How to economize in tie renewals?

What wage advances have been granted?

Answers to these and other practical questions will be found elsewhere in this issue.

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WE GUARANTEE, that of this issue 8,700 copies were printed; that of these 8,700 copies, 7,983 were mailed to regular paid subscribers, 11 were provided for counter and news company sales, 73 were mailed to advertisers, 184 were mailed to employees and correspondents, and 449 were provided for new subscriptions, samples, copies lost in the mail and office use; that the total copies printed this year to date were 52,750, an average of 8,792 copies a month.

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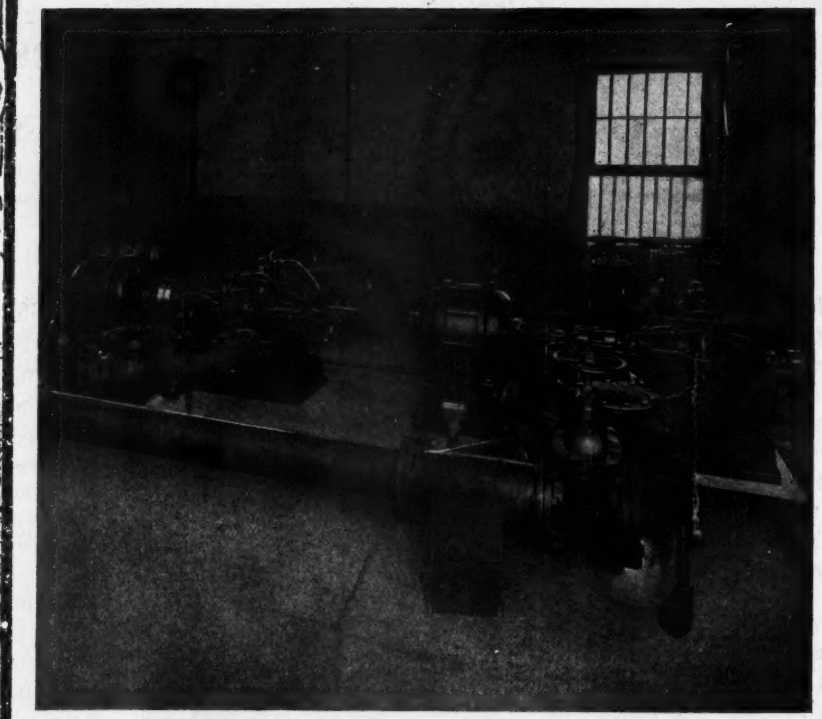

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Railway
Engineering and Maintenance

Volume 19 June, 1923 No. 6

THE VALUE OF A YARDSTICK

A MAINTENANCE of way officer who has made a marked success of his department attributes this success to the fact that he has made it a practice to establish yardsticks or units of measurement by means of which he is able to gage his results. His plan deserves special emphasis. Without a goal no one has knowledge of the extent of his progress; neither does he have a measure of his shortcomings.

A yardstick is valuable to the man in charge of any department; it is equally important for men in subordinate positions. No man can do his best work without it. The objective for a foreman may call for specific production by his gang in terms of a certain number of ties renewed or a number of yards of concrete placed in a day. The objective for a division engineer may be a given amount of rail laid per man per day by the gangs on his division or a specific unit cost of this operation. Whatever the objective, the very fact that a goal has been established will instinctively cause every one to concentrate more directly on those operations contributing to the objective and will of itself tend to eliminate lost motion and inefficiency.

SOME REFLECTIONS ON RAIL STATISTICS

THE statistics of rail production in 1922, compiled by the American Iron & Steel Institute and abstracted on another page, reflect a number of trends in maintenance of way practices which are of special significance. In the first place, one is impressed with the practically complete substitution of open-hearth for Bessemer steel. Although first coming into use in any quantity less than 20 years ago and passing Bessemer steel in tonnage for the first time in 1911, the general adoption of open hearth has been so rapid that less than three per cent of the tonnage rolled last year was of Bessemer steel. In fact, the proportion is now so small as to be negligible.

Of equal interest is the trend towards the use of rail of heavier sections. While rail weighing 85 lb. per yard and over was first divided into two groups in 1914, when the tonnage of sections weighing 100 lb. and over aggregated only 60 per cent as much as that weighing 85 lb. and less than 100 lb., the heavier sections exceeded those next lighter last year by 20 per cent. Furthermore, a number of roads have gone to sections above 100 lb. this year for the first time, so that the showing will be even more pronounced when the 1923 statistics are available.

Even more significant was the low volume of rail tonnage rolled last year, maintaining as it did the low production of the preceding year. The volume of rails rolled for the steam roads was less in 1922 than in any year since 1914 and was only two-thirds of the average for the five year period from 1909 to 1913, inclusive. This decline would be even more striking if the tonnage could be converted into mileage and thus eliminate the influence of the heavy sections. This decline is a reflection of the decrease in construction activities, but it indicates even more the less liberal policy in rail replacements. While experience has demonstrated that the heavier sections of rails are yielding a greater proportionate service life than the increase in sections would indicate, the marked reduction in consumption is a direct reflection of the extent to which maintenance of way expenditures have been curtailed during the last two years. The present year, with its large program, will show a marked reversal in this respect.

WHAT ABOUT CONSOLIDATION?

THE wide publicity which is being given to the subject of the consolidation of the railroads as the result of extended hearings before the Interstate Commerce Commission has led to a general discussion of this subject among railway employees and others and no little apprehension as to the consequences of an amalgamation of the properties along the lines suggested. To allay any feeling of anxiety among our readers we desire to emphasize the fact that the clauses of the Transportation Act relating to consolidation provide means by which consolidation may be permitted but there is nothing in the law which may be construed as giving the Interstate Commerce Commission, or any other body, the power to *enforce* consolidation. One of the chief functions of the law is to relieve the railroads of the operations of the anti-trust laws, which have, heretofore restricted or prohibited consolidation in the recent past. It also provides that all consolidations shall be subject to the approval of the Interstate Commerce Commission and requires railroads desiring to exercise the power of purchase or control of other properties to secure the requisite authority from the Commission.

The active interest now taken in the subject of consolidation arises from the one section of the Act which is distinctly mandatory, namely that which requires the Commission to prepare a plan for the consolidation of the railroads in the country into a limited number of competing systems, this plan to be given wide publicity and to be the subject of a series of hearings for the purpose of developing facts and opinions concerning its practicability. The Commission has carried out this portion of the Act and the hearings resulting therefrom are now in progress. However, there is nothing in the law giving the Commission the power to force the railroads to combine in accordance with such a plan. In short, as the law now stands, consolidation can take place only if the stockholders of the railroads involved are willing, and if the plan is satisfactory to the Interstate Com-

merce Commission. In general then, until marked changes are made in the law, consolidations of the railroads cannot be expected to be brought about except as economic considerations lead their managements to see the advantages to the properties they represent although the attention now being given to the subject will undoubtedly stimulate activity in this direction.

A TENDENCY TOWARDS FURTHER SPECIALIZATION

THE responsibilities of the average maintenance of way officer cover such a wide field that they call for a high degree of technical knowledge in many diversified lines. At the same time the demands on his time for the conduct of his purely administrative duties are so exacting that it is difficult for him to apply himself to the intensive study of any but the most important or frequently recurring problems with which he is confronted. This means that these branches of his work which are the least pressing, or which are only indirectly related to the business of transportation are often given more or less perfunctory attention.

It is in frank admission of this deficiency, that the railroads are placing some of the more special problems under the general supervision of a special officer who can devote his entire time to the study of their requirements and co-operate with the line officers of the maintenance of way department in their administration.

The most recent illustration of this tendency is the action taken by the management of the Chesapeake & Ohio in providing a special officer who will devote his entire attention to the problems of bridge and building painting. Few roads have gone so far with such specialized supervision, but it presents a number of advantages that deserve serious consideration. According to the usual organization, maintenance of way painting is handled by the supervisor of bridges and buildings as an adjunct to his more pressing responsibilities. Because painting is considered less important than the inspection and repair of structures, a man is usually placed in charge of this work who has received his training as a bridge and building foreman. It is only in rare instances that a master painter is promoted to supervisor.

Therefore, in the majority of cases, the supervisory officer himself has had no direct experience in painting and is inclined to place a larger degree of responsibility on the master painter than is the case with the foremen in branches of the work in which he has had more intimate contract. For this and other reasons maintenance of way painting has not received the full measure of supervision which the importance of the work demands. Painting calls for the expenditure of a large sum of money. It has an intimate bearing on the life of the structure and presents a wide field for the development of more economic practices. The action taken by the Chesapeake and Ohio and the reasons therefore, are worthy of careful consideration.

THE SUPERVISOR AN ENGINEER OF MEN

The success of any plan for effecting economies in track work is dependent upon the supervisor. He is in direct touch with the foremen and the men and his attitude is reflected in them and in their work. Let him have a love and enthusiasm for the task before him, let him have the qualities of true leadership, the ability to give orders understandingly, and the persistency to "follow them up," a reasonableness in this attitude towards his men, an interest in their welfare, an assumption of his responsibilities which precludes his ever "passing the buck" to some unfortunate foreman, and he will have his men with him all the way and he will indeed be an "Engineer of Men."— *From an address before the Metropolitan Track Supervisors Club, New York, by Earl Stimson, chief engineer maintenance, Baltimore & Ohio.*

THE PROBLEM OF THE BURNED TRESTLE

AMONG the train accidents reported briefly in the preceding issue, the one resulting from the burning out of a three-span pile trestle can well be given serious thought by the maintenance of way officer because it was brought about through a series of circumstances which could readily be duplicated on almost any other line of similar character on the American continent. The bridge was of wood. It had a sheet metal fire protection but this was incomplete by reason of a four inch longitudinal gap inserted to provide insulation for a track circuit for a crossing bell. The fire which destroyed the bridge occurred late on a Sunday afternoon and the line was one of such light traffic that in accordance with normal usage in this country it was not patrolled outside of the regular working hours of the track forces and the accident occurred early in the morning before the section gang had an opportunity to visit the site of the bridge.

This accident points to one of those intangible benefits of the ballasted deck timber trestle or the reinforced concrete trestle which ordinarily cannot be represented in dollars and cents in comparative cost estimates. It also demonstrates that a sheet metal protection is not a protection unless it covers the structure completely. Two questions are raised by this phase of the problem; first, the possibility of interrupting the circuit through the length of the bridge to permit the use of an unbroken sheet metal cover and, second, that in the case of a line with automatic block signals whether the protection against broken rails on the bridge should be sacrificed by eliminating the track circuit for the length of the structure in order to use a continuous covering. But whatever answers are given to these questions, one fact is brought out clearly by the accident, that any sheet metal covering, to be effective, must be continuous over the entire deck, and any breaks or opening in the sheathing, whether introduced deliberately as in this case or present as the result of poor maintenance, will largely destroy the value of such a protection.

AVOID WORK TRAIN SERVICE

MANY operations confronting engineering and maintenance of way officers require the use of heavy equipment, such as pile drivers and ditchers on the main tracks. It has long been customary to operate such equipment with a locomotive and train crew, not primarily to aid in the performance of the work itself but to enable this equipment to be withdrawn to the nearest siding quickly when required to allow trains to pass. With the various restrictions which have been placed on train service the cost of this service has risen to such a point as to make recourse to other methods advisable where possible. This condition led to the development of the self-propelled pile driver several years ago. More recently it has given rise to the construction of a self-propelled ditcher capable of drawing two cars with it.

As an alternative expedient one road has recently purchased several small locomotive cranes mounted on crawler treads, which it is employing in ditching service, with considerable facility, because these ditchers can "get into clear" by moving into the ditch on the approach of a train. Where the materials excavated cannot be disposed of by casting over the bank they are loaded into small cars running to the end of the cut on narrow-gage tracks laid over the ditch. The elimination or decreased use of work train service not only saves heavy expense but also obviates an enormous loss of time to the maintenance forces and equipment. Furthermore, with the heavy traffic now being handled and with much of the motive power in a depreciated condition, locomotives can be spared in many instances only at the sacrifice of revenue traffic. The interests of all departments will be conserved if this season's work is planned to reduce the demands for locomotives to the minimum.

GETTING READY FOR HEAVIER POWER

THE railways are now receiving large numbers of new locomotives and many more are on order. To a considerable extent they are supplementing the power already operating on main lines. To an even greater extent they are replacing engines which are being relegated to branch lines and which, while lighter than the new ones coming from the builders, are heavier than any previously operated on these secondary lines. In order that these locomotives, as well as those coming from the builders, may render the maximum service of which they are capable, it is necessary that their arrival be preceded by adequate preparations by the maintenance of way department.

While it is assumed that bridges have been strengthened, passing tracks extended, roundhouse stalls lengthened and adequate provision made for turning the locomotives at the terminals, it is a frequent experience that the appearance of heavy locomotives on branch lines is followed immediately by evidences of weakness in the track which limit their full utilization. This points to the necessity for the strengthening of the track structure prior to the imposition of heavier power on it; the addition of ballast, the relaying of the rail, and the improvement of the line and surface, will add much to the efficiency with which heavier locomotives can be operated. Engineering and maintenance of way officers should keep in close contact with officers of the transportation department in order that they may be enabled to anticipate relocations of power and to co-operate in insuring maximum returns from the heavier locomotives.

TREATMENT IS NOT ENOUGH

MUCH interest is being shown, and properly so, in the reductions in the number of ties required for renewals by several roads which have made it a practice to treat their ties for many years. These evidences of the value of tie preservation are without doubt largely responsible for the marked increase in interest in the subject of timber treatment during the last few years and the rapid growth in the number of ties being treated. However, treatment alone is not enough to insure long life of ties. Of equal or even greater importance is the securing of the proper ties for treatment, with respect to size and quality of timber.

The Atchison, Topeka & Santa Fe has been a pioneer in the treatment of ties and the decrease in its tie requirements has been most marked in recent years. No small part of the success of this road is due to its rigid insistence on ties of adequate size for the service required in track and on their freedom from decay at the time they were treated. This consideration is of particular importance at the present time when the abnormally heavy demand for ties and the evidences of hysteria on the part of some roads are leading to the acceptance of large numbers of ties which are undersize and in which decay is well advanced. One cannot expect such ties to give service in track even though treated. It is too much to expect this of treatment. To secure the full benefits of treatment it is necessary to start with the proper kind of tie.

THE MAINTENANCE MAN'S PART

THE HIGH degree of efficiency with which the railways are now operating is indicated by the fact that 974,531 cars were loaded during the week ending May 12 (the latest for which statistics were available at the time of going to press). This figure was within four per cent of the heaviest loading ever attained at any season in any previous year. Yet in spite of this heavy traffic, the car shortage has been reduced steadily during recent weeks, until on May 12 it was less than 10 per cent of that of last fall. While this record is a cause for much gratification it also shows the small margin of safety under which the roads are working and the necessity for extreme vigilance on the part of every one if the roads are to meet the heavy demands of this fall successfully.

Engineering and maintenance of way employees have no small part in this program of increased transportation, for they form an important unit in the organization through whose united efforts freight and passengers are transported. Without their full co-operation and the development of their highest state of efficiency, the efforts of other departments will be handicapped and the net result will be a reduction in the amount of transportation service which can be rendered the public. Their contribution to the common cause may be rendered in a number of ways.

The railways are now engaged in a large program of improvement work designed to increase line and terminal capacity. The conduct of this work so that those facilities most needed and most readily built can be placed in service at the earliest possible date will offer a real contribution to the railway's program.

The organization of this work so as to interfere least with traffic also deserves special consideration. Not least among the ways in which the engineering department can aid in the conduct of its construction operations is to so perfect its methods as to utilize most fully equipment other than that capable of rendering revenue transportation service.

Another way in which the maintenance of way department can contribute to transportation production, and one, the importance of which is not always fully recognized, is by bringing its tracks and structures to that condition which offers the least likelihood of interfering with train movements. It is a common experience that the bringing of tracks to proper line and surface results in the more rapid movement of trains. This also results in decreasing the number of derailments, with a resulting disorganization of train movements.

The present situation and that of the near future demands that engineering and maintenance officers consider the transportation aspect of their work more fully than ever before. If they will do this they will so arrange their operations as to cooperate more fully with the transportation department in establishing new records for the amount of traffic handled and thereby demonstrating to the public thaat the railways are operated efficiently.

Letters to the Editor

WHY BOLT FILLER BLOCKS TO THE STOCK RAILS?

Ysleta, Texas.

To the Editor:

In the May issue of *Railway Engineering and Maintenance*, G. W. Lamb, extra gang foreman of the Kansas City Southern, discussed various phases of switch work, in which I find that my views are somewhat different. Especially is this so concerning heel fillers for switch points. I do not think that the filler block should be bolted to the stock rail, because in hot weather the steel, in running, will put line kinks in the rails at these points. The better way, I think, is to have recesses in the blocks for the bolt heads, making the blocks serve as the outside splices which will allow for contraction and expansion and not disturb the alinement. Instead of having to use special filler bolts, common machine bolts will serve the purpose. Where bolts going all the way through connect the stock rails they may be sheared off or bent when the rail begins to move, and I will agree with Mr. Lamb that they will then be hard to get out. The heel filler acts both as a foot guard and a brace for the joint, so why bolt it to the stock rails at all? Use a shorter, cheaper bolt, and make a better, safer job.

L. Flynn,
Section Foreman, Galveston, Harrisburg & San Antonio.

THE THINGS YOU DON'T SEE

Illinois.

To the Editor:

Every good householder takes pride in his premises, which means that he takes good care of them, and thus saves money. Every spring he cleans the leaves out of the gutters and, if they need it, gives them a coat of paint inside. In the fall when the screens are taken down they get a thin coat of paint and are put away for the winter. Screen wire costs but a few cents a square foot, but it costs much more in labor to renew it than the wire is worth. Common galvanized iron gutter doesn't cost much, but the labor to remove the old and place new amounts to several times the cost of the material, because the men must erect scaffolding before they can get to the job. On the average railroad these two little items seem to have been forgotten entirely. By actual test common unprotected screen wire will hardly last a season, while the average householder expects with good care to get 5 or even 10 years' wear from his screens. On railroads where so much box gutter is used the expense of renewing is much more. Still the railroads buy screen wire and guttering by the mile year after year, and it gets little if any attention and no one seems to care. It is not uncommon to see weeds and grass, and even little maple trees growing in station gutters. We have advanced in so many directions and succeed in nearly every thing we undertake, but these two little items get little attention. Some day someone will find these leaks in the railroad purse and stop them.

Master Painter

TRACK TRAINING ESSENTIAL FOR MAINTENANCE ENGINEERS

Newark, Ohio.

To the Editor:

In every line of endeavor, it is an axiom that those who direct have attained that right to direct through merit, ability and faithful adherence to duty. Maintenance engineering entails the use of a number of special trades or professions and the man who directs the maintenance of a division of a railroad, ordinarily known as a division engineer, necessarily must have qualification of the special trades or professions to direct others intelligently

Just what are the qualifications of a division engineer? First of all, he must be technically trained. He must be conversant with the rules and regulations governing the operation of trains. He must have good judgment. He must know how to handle men and last but not least, he must "know track" from A to Z (Z inclusive, if you please). Technical training can be acquired at a college or university, but (possibly excepting a knowledge of operation of trains) the other qualifications named must be gotten from experience.

The young man of today who graduates from college and who desires to follow railroad engineering as a vocation usually takes a position on the engineering corps of a division and begins at the bottom. His work at first is that of drafting, making small plans of new industrial tracks, estimating new tracks, making blueprints and so forth. Later, he is promoted to a higher position, still on the corps, but not one whit better qualified from experience as a track man than when he first became associated with the railroad.

It is the practice and custom of the majority of railroads of this country to select men for the position of division engineer from their own engineering staff, but at the same time these same railroads have made no provision in their program of training for the men they select as division engineers to gain experience and become expert in track work by actual contact with work on track. Yet, they are expected to be and must be able to direct and tell others under them how to do work which comes under their supervision.

Surely, this is not logical. Why not insist that every division engineer must have served an apprenticeship as supervisor or roadmaster? Why not make it a practice to promote engineers to roadmasters after serving their apprenticeship on the corps? It will make better railroad men, better and broader by reason of their track experience and should prove a good investment for the railroads.

C. E. Rozzelle,
General Foreman, Baltimore & Ohio.

NEW BOOKS

Highways and Highway Transportation.—By George R. Chatburn, professor of applied mechanics and machine design and lecturer on highway engineering, University of Nebraska, Lincoln, Neb. 472 pages, illustrated, 5½ in. by 8 in. Bound in cloth. Published by Thomas Y. Crowell Company, 426 West Broadway, New York City.

The rapid development in highway construction is of interest to every engineering and maintenance of way officer in railway service, not only because of the similarity of many of the problems, but because of the increasingly important part which the highways are coming to play in transportation. The book is divided into two general sections, (1) the development of highways and (2) their use. The first part traces the development of the highways from the earliest trails to the highly developed hard road of the present day, while the second discusses the planning of highway systems, the selection of road types, the effect of ease and cost of transportation on production and marketing, etc. Of particular interest to engineering and maintenance officers is the chapter devoted to highway accidents with special reference to those occurring at railway grade crossings. This volume contains a large amount of information regarding highways and the possibilities for their use which will be of interest to those studying this subject.

Unique Pile Driver Used in Trestle Reconstruction Job

Bridge Work on Northwestern Pacific Develops Some Interesting Methods and Special Equipment

By C. M. Kurtz
Structural Engineer, Northwestern Pacific, San Francisco, Cal.

THE MAIN line of the Northwestern Pacific is carried across Corte Madera creek and the salt marshes adjacent thereto on a single-track, 93-ft. combination through truss swing span with single-track trestle approaches. It having become necessary to replace the swing span with a structure of more modern type and of greater load carrying capacity, it was decided to renew it with a double-track bascule bridge designed by the Scherzer Rolling Lift Bridge Company and to construct new double-track, open deck trestle approaches. The grade on the old trestle was 0.866 per cent on the west approach and 1 per cent on the east approach (rising eastwards), with level track across the swing span. The grade on the new structure will be 0.8 per cent from bulkhead to bulkhead of trestle approaches, causing a maximum separation of about 1½ ft. between the old and new grades near the west end of the drawbridge. The present single track will be the future westbound track and the new track constructed 13 ft. to the right (going east) will be the eastbound track.

The plans of the open deck trestle approaches were drawn by the writer, and call for redwood piles (8 per bent), redwood caps and Douglas fir stringers, ties, guard rails and bracing. The redwood timber was specified for the piles and caps on account of its lasting qualities, and the Douglas fir for the stringers, ties, etc., on account of its greater strength. The bents of the new trestle are 15 ft. on centers, whereas those of the old are 16 ft. The locations of the new bents have been so planned as to clear the old bents, except about every eighteenth bent of the new structure, which is spotted opposite an old bent, special short spans being introduced on either side of such a combination bent. Such old bents, with the addition of a new outside batter pile, are utilized in the new structure, while all the other old bents are discarded, the piles being cut off at the ground surface. The piles of the old trestle (Douglas fir driven in 1908) are in a fair state of preservation, and are being abandoned principally because the bents are 16 ft. on centers instead of the railroad's standard—15 ft.

Special Driving Problem

The driving of the heavy, long and abnormally large diameter piles required for the trestle approaches presented a problem in the type of a driver to be used. The railroad's track driver leads were not wide or long enough for these redwood piles, nor was its framework of sufficient strength to handle them. With the tracks designed for 13-ft. centers, there would not be enough width on one-half of the double-track trestle caps to permit the use of the ordinary top driver that skids on top of the caps of the bents. A. A. Robertson, foreman of bridges

The Ties Were Sawed Off Just Inside the Outside Stringer

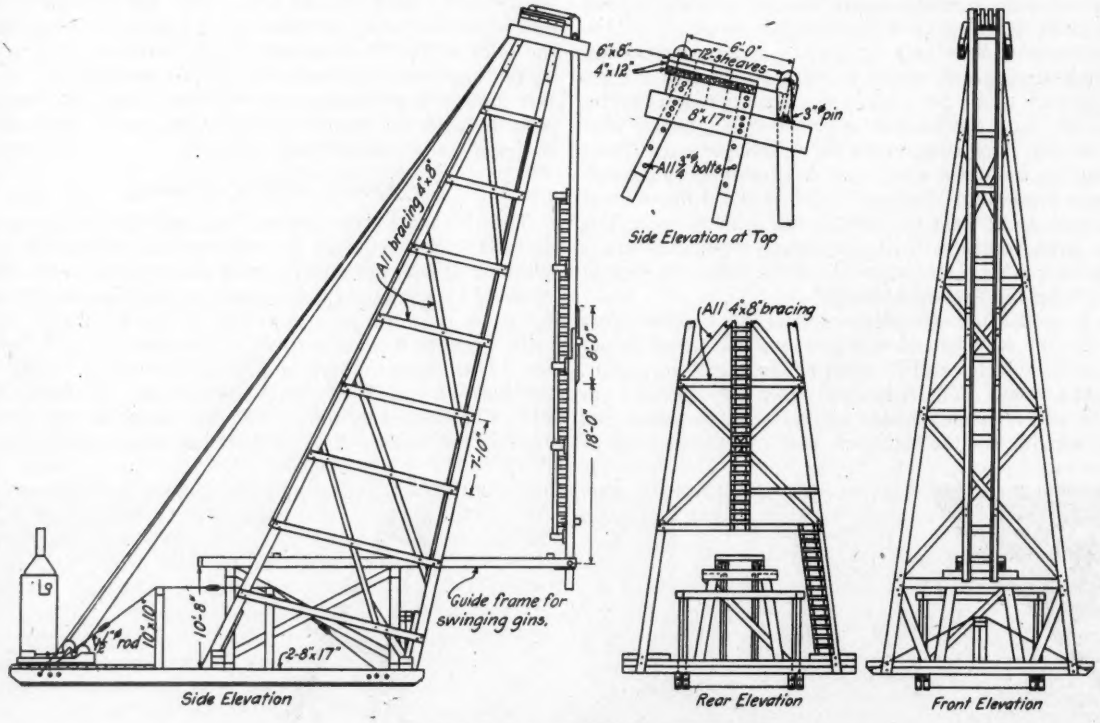
and buildings, therefore, designed and constructed a special type of land skid driver, with a leaning tower, from which pendulum or swinging leads are hung, that facilitates the driving of all the piles, both plumb and batter, exactly as called for in the plans. This driver is shown in the drawing and two of the photographs.

The sills of this driver consist of two parallel chords 45 ft. in length and 14 ft. out to out in width, braced, tied and strutted so as to form a rigid framework. Each chord consists of two units of 8-in. by 17-in. timbers, chorded together with ⅝-in. bolts through separators 2 in. thick. Each chord is trussed by a 1½-in. rod, provided with turnbuckles, passing over the caps of two 10-in. by 10-in. posts. These truss rods are also provided with "eyes" at the sill ends, and connect with pins 2 in. in diameter which pass through the sill timbers. They function to prevent any appreciably deflection of the forward end of the framework when it is overhanging the front face. These projecting ends support the bearings for the 3-in. pivot pin upon which hangs the pendulum or swinging leads. At the top of the tower are two 6-in. by 8-in. beams, upon which are the bearings for two sets of 12-in. sheaves for the pile and hammer lines.

The pendulum leads are made from 10-in. by 12-in. timbers spliced and blocked together, as shown in detail, there being five blocks shaped from 8-in. by 17-in. timbers four feet long. The lead timbers are 26 in. face to face, and are provided with 2-in. by ½-in. iron plate runners. A ladder is built on one side of the leads for the convenience of members of the crew in placing pile rings, adjusting blocks in yoke irons, etc.

Batter Controlled by Adjusting Guide

A horizontal guide frame for adjusting the batters is fastened to the bottom of the pendulum leads by means of pins 2½ in. in diameter, and extends into the interior



Principal Details of the Pile Driver

runner supporting sills, and is subjected to the greatest loading, which is occasioned by the lifting of the longer piles. The bottoms of the sills are shod with 8-in. by 3-in. ironwood skids.

Tower 70 ft. High

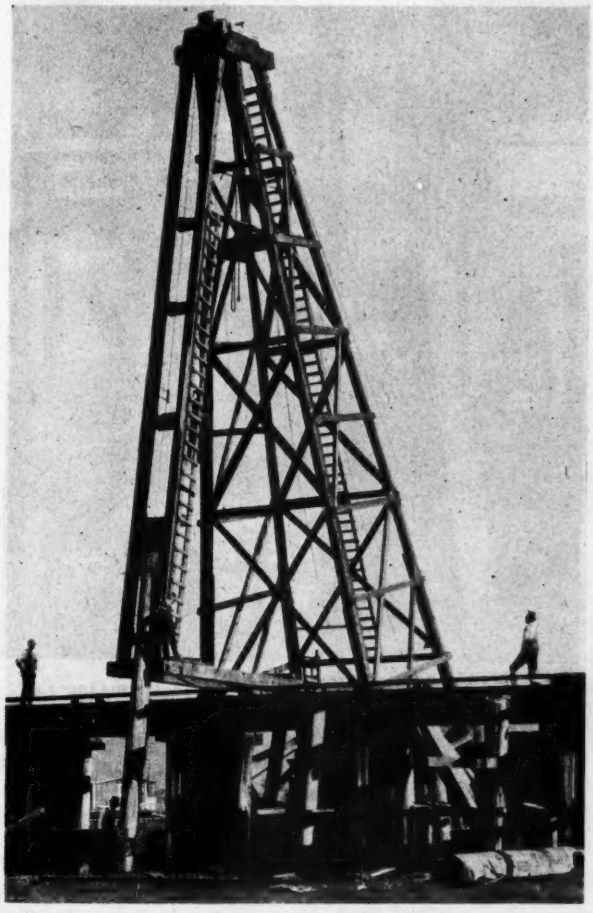
At the forward end of the sills is a heavy, double cross-beam, the overhanging end of which is trussed up with a 2-in. rod passing over a post at the center. Near the middle of the sills is another double cross-beam securely anchored to the sills. Upon these cross-beams stands a tapering tower about seventy feet high, consisting of four posts, all tapered from 12 in. by 12 in. at the bottom to 8 in. by 8 in. at the top, the forward posts being inclined as shown, with a batter of 2¼ in. per ft. The tower is braced on each of its sides by 4-in. by 8-in. timbers bolted to the posts, and is backstayed by two lines of ⅝-in. cables fastened to the rear truss-rod pins in the sills. Near the top and on each side of the tower 8-in. by 17-in. beams are framed which project about three feet at the of the tower, where it rests upon the 12-in. by 12-in. caps of two framed bents of two 12-in. by 12-in. batter posts, braced longitudinally by 4-in. by 10-in. timbers. The movable or adjusting guide frame consists of two 8-in. by 12-in. timbers, 40 ft. 6 in. long, placed 4 ft. 9 in. center to center, and framed together by three 8-in. by 6-in. ties bolted thereto. It moves on the outside of a stationary frame of two 8-in. by 12-in. timbers bolted to the caps of the supporting bents. Holes for stop pins 2 in. in diameter are provided at the proper points in both frames for holding the leads in the position desired to give the piles the direction called for by the trestle plans. The frame and leads are moved backwards and forwards by means of two lines running to the gypsy of the donkey engine.

The normal position of the driver while at work is as shown in the photographs, that is with its axis at right angles to the railroad track. Mud-sills of 17-in. by 8-in. timbers, spaced about 4 ft. center to center, are laid parallel to the axis of the driver, and upon these are laid five

or six runner supporting sills, likewise of 17-in. by 8-in. timbers. The runners which come in contact with the skids of the driver frame are 12-in. by 4-in. ironwood, well greased.

As the driver is moved eastward it becomes necessary to block it up small amounts on account of the 0.8 per cent ascending grade of the railroad, the surface of the marsh being level. It is also necessary to make changes in the elevation of the bottom of the pendulum leads in order to make them clear the increasing height of the deck of the old trestle in the vicinity of the creek. This is accomplished by sawing off short lengths of the leads and blocking up the guide frame upon its supporting bents.

U-straps (old bridge floor beam hangers) are set in the sides of the bottom frame near each corner, from which on either side, according to the direction in which the driver is being moved, two sets of blocks and tackle connect to a long steel cable, the far end of which is anchored to a pile. The two tackle lines are passed



Driving One of the Batter Piles

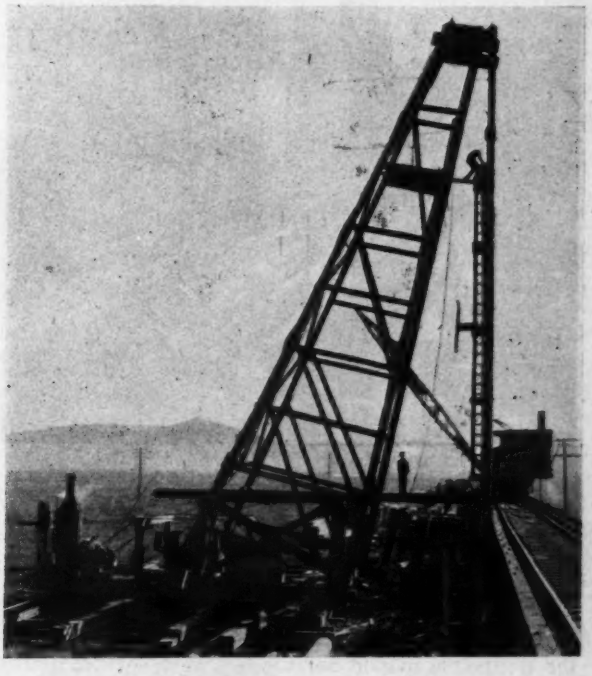
through snatch blocks conveniently placed, and are operated by the gypsy winch of the donkey engine. The forward and backward movement of the driver is likewise effected by blocks and tackles, the lines of which run to the gypsy.

In handling piles for position when they are being driven to the same inclination as the front of the tower, the use of a "buck" line is found convenient. This line runs from a gypsy of the engine to the pendulum leads at about two-thirds their height, and is used to counteract the action of gravity, pulling the pile backwards between the leads during the time that blocks are being placed in the yoke irons.

The counterbalancing of the overhang of the tower and its suspended weights, consisting of leads, hammer and piles when being lifted, is effected by the weight of the donkey engine and about four tons of rails placed on the rear portion of the deck of the foundation frame. The weight of the hammer is 4,000 lb.

Renewal of Deck on Old Trestle

There being two intervals of time totaling about 4½ hours a day when there is no traffic upon the trestle, advantage is taken of the opportunity to remove the old



Driving a Plumb Pile with the Driver

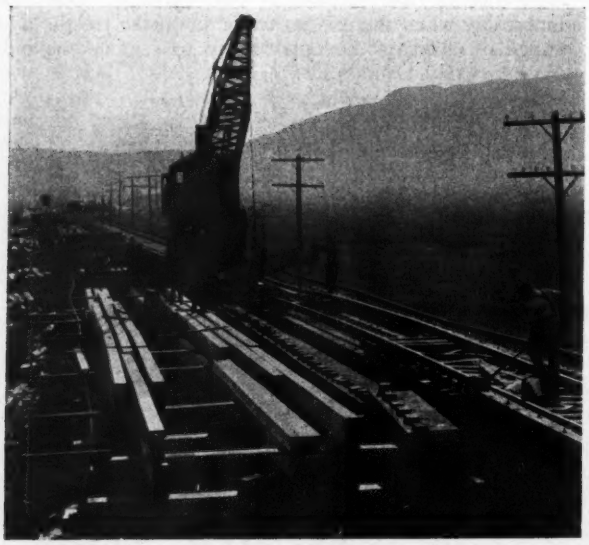
stringers, ties and guard rails of the old trestle and replace with new material. The chord bolts through the old stringers having been removed, the old redwood ties are cut through on each side, just inside of the outside stringers and guard rails, also, at the same time, the track spikes are pulled. With the assistance of a locomotive crane the old parts of the trestle decking are deposited on the surface of the marsh, and new chorded stringers of standard lengths to fit to caps on the new bents are placed in position. These new stringers at first bear temporarily upon the old bents, provided with extra caps (on account of the grade separation), and are later lowered to their final position upon the caps of the new bents by means of hydraulic jacks.

One of the photos shows the old deck being wrecked and the new stringers to be installed, resting upon the new stringers of the trestle extension for the second track. Another shows a section of three 30-ft. stringer chords being launched under the rails of the old track. The third or power rail shows in these two views. During this phase of the work, the electric current is switched off for obvious reasons. Immediately after the stringers have been placed, new ties are hurried into temporary position between the rails and stringers, and the rails spiked thereto to allow the crane to advance an additional 30 ft. As much as 180 track feet of stringers and ties have

been changed in one day. The run-off between the old and new grades is made in a distance of about 150 ft. and is effected by temporarily blocking between the stringers and caps.

It is of interest to note that the portion of the marsh requiring the longest piles is not in the vicinity of the channel of Corte Madera creek, but a full quarter of a mile therefrom, at the westerly end of the west approach.

Pile driving in the west approach commenced on September 5, 1922, and to date, January 8, 1923, 67 double-



Swinging a New Stringer Chord Into Place

track bents have been driven therein, the piles making an average penetration of about 70 ft. in the ground, the longest pile from cut-off to bottom being 86 ft.

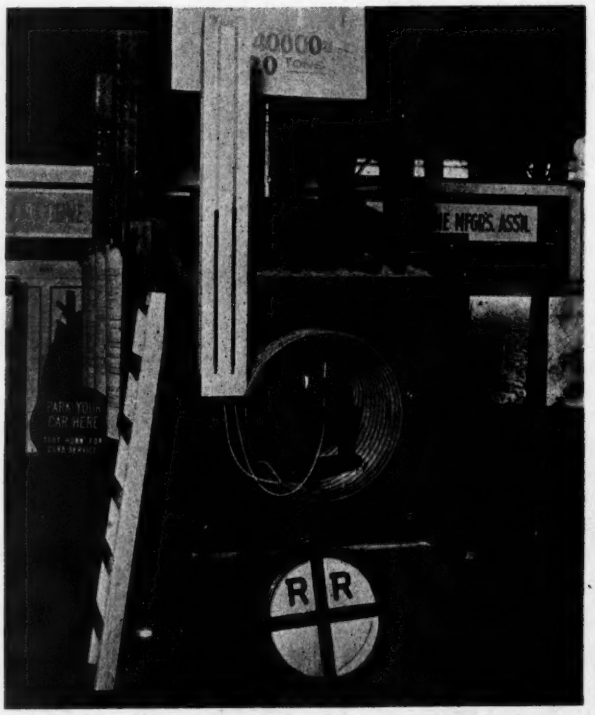
It is noticed that the bents of the old trestle are displaced slightly by the driving of the new piling, but neither the transverse motion nor the upheaving of the marsh, which upheaving carries the old trestle with the marsh, are sufficient to interfere with the operation of the trains.

Striking an Automobile at a Street Crossing in Columbus, Ohio, Causes Bad Wreck of Passenger Train on the Big Four

Testing Culvert Pipe

AN ENDEAVOR to obtain as near an approximation as possible of the loading conditions imposed on a culvert in an embankment has led to the development of apparatus in which tests were conducted by the Armco Culvert & Flume Manufacturers' Association at the National Railway Appliances Exhibit in Chicago in March and more recently in the plant of the American Rolling Mill Company at Middletown, Ohio. The results obtained in this demonstration are of value as affording some measure of the resistance which corrugated pipe culverts offer to deformation under embankment loads.

The test apparatus consisted of a strong wooden box supported in a structural steel frame. A section of the culvert was placed in this box and entirely surrounded and embedded in torpedo sand to a depth of 12 inches



The Loading Test Apparatus as Viewed from One End

over the top of the culvert. The top surface of this sand was subjected to heavy pressure through the agency of three railroad crossties, spaced 18 inches on centers, the load being applied to the ties at standard gage spacing by means of two hydraulic jacks of 100-tons capacity.

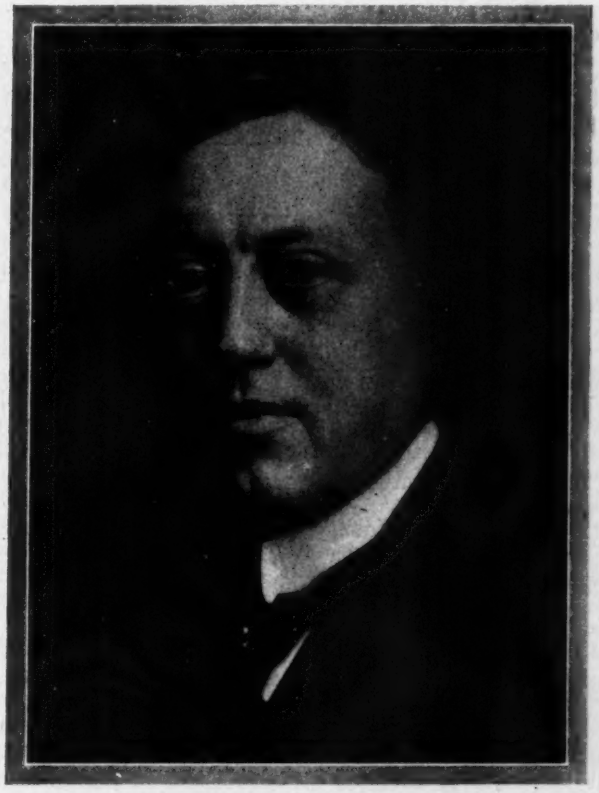
Provision for the measurement of the deflection of the crown of the pipe at three points in its length was made by installing three brass pumps in such a manner that the deflection of the crown would cause the piston rods of these pumps to apply pressure on the liquid contained in the cylinders. The pump cylinders, which were two inches in diameter, were connected by flexible tubing with corresponding glass gages of ½ inch net internal diameter and a length of 6 feet, mounted on a graduated scale. Thus any movement of the culvert crown would cause the liquid to rise or fall in the gage glasses. Repeated loads up to 120 tons were applied to the jack with no visible effect on the culvert pipe, and with only very light movement of the liquid in the gages, in fact, no movement was noted for pressures less than 110 tons.

Are You Willing to See the Other Fellow's Side of It?

An Attitude of Tolerance, Says Mr. Safford, Is Essential for Success In Your Dealings With Others

By WALTER S. LACHER

"THERE are times when every young man in Railway service needs assistance from his superior and I believe that every officer should do his part in helping the young fellow get a start. I have always had a feeling of real affection for the man who was superintendent of the division on which I first served as roadmaster. He seemed to realize that I was young and lacked experience and did everything he could to help me. His kindness made a lasting impression on me because I have since observed how some young men have failed because they were not given the advice and support at the critical period of their earlier business life that they should have received from their superiors. However, the obligation upon the part of the superior officer to the subordinate to support and develop him is not substantially less than the obligation upon the part of the subordinate to serve his superior loyally and efficiently."



H. R. Safford
Vice-President, Chicago, Burlington & Quincy

These are not the thoughts of a passing moment, but they represent the established convictions of a man who has evinced a particular interest in the young man in railway service. H. R. Safford, vice-president of the Chicago, Burlington & Quincy, is a leading spirit in the current movement to develop closer cooperation between the railroads and the technical schools. As a past president and director of the American Railway Engineering Association, he has had an important part in the creation of a special committee of that organization which is now directing its efforts along lines that will accrue to the advantage of students who desire to follow railroad work. But his interest is by no means confined to the college man nor is it manifested only in academic discussion. He has always maintained a close contact with the man in the field and has ever been ready and willing to hear the young man's story and to help him solve his problems, with all observing a friendly, sympathetic attitude that evinces genuine understanding.

"At what point in a man's carreer is he most in need of help from others?" For instance, in our own case, what particular promotions caused you to have the greatest misgivings?"

"I do not recall ever having been oppressed by thoughts of the increased responsibilities that came with advancement. Instead my feelings were those of pleasant anticipation and I believe this is the usual inclination of men who advance by progressive stages and, as a matter of fact, to approach increased responsibilities with such feelings is an element in whatever success may result."

Mr. Safford attended Purdue University, spending his vacations on various kinds of railroad work and later availing himself of the opportunity to become rodman on second track work with the Illinois Central. After several years of construction, during which he was advanced to instrumentman and later to assistant engineer he spent two years in the chief engineer's office as an assistant on miscellaneous work. In 1900 he was made roadmaster and after three years in that position was promoted to principal assistant engineer. Two years later he was appointed assistant chief engineer, and in 1907, chief engineer maintenance of way.

Subsequent to this he was appointed chief engineer of the Grand Trunk and seven years later engineering assistant to the regional director of the Central Western region of the United States Railroad Administration and later assistant to the president and then vice-president of the Chicago, Burlington & Quincy.

"Young men have often come to you with their troubles. What do you tell them?

"That there are two fundamental principles which form the groundwork for meeting the demands of any organized business successfully. The first is 'Your primary obligation to serve your superior to the best of your ability and your conscience rather than the clock should tell you whether you are meeting your obligation, The second is, 'Advancement will come to you in proportion to your capacity for greater responsibility and a willingness

to do more work than is specifically required of you in your present position. But, you yourself must show that you can handle more. Your superior is in no way obligated to bring this out of you and you should not expect it of him. This voluntary action on your part is necessary to demonstrate what he wants to know to satisfy himself of your qualifications for greater responsibilities."

The superior has certain responsibilities in his relations with his subordinates. He should always be careful to see that an assistant receives full credit for any meritorious work or any ingenious ideas he may have developed. There are some men who sometimes forget and want to take all the credit themselves. This is not only a selfish but an extremely shortsighted policy, because any credit accorded the subordinate always reflects on the superior, while the effect on the entire organization is to set up an incentive that is sure to produce increasingly good results."

"But what should be a man's attitude in case one of his assistants makes a mistake or blunders in his work?" This question was prompted by statements of men who have worked with Mr. Safford. In their opinion few officers display more human qualities in dealing with the man who is in trouble. More often than not, he will manifest the responsibility which he himself feels under the circumstances. "We ought to be more careful" or "We can't afford to take such chances," are expressions of his which drive home his disappointment in his assistant's performance in a way that creates a lasting impression without engendering resentment.

"Such problems are easily solved," he replied, "if a thorough understanding has prevailed between superior and subordinate. An officer should always endeavor to secure the perfect confidence of his men. He should show them that his first motive in case they get into trouble, will be to help them. I remember very well how this was put to me by the engineer in charge when I was given a residency on construction. 'Remember' he said, 'if you make an error, which you will do occasionally, I want you to tell me about it promptly. I'll do everything I possibly can to help you as long as I know that you tell me of your mistake just as soon as you find it out.'

"If a man makes an honest error and admits it frankly, then I should say that the discipline ought to be light unless it is a repetition of a similar previous error. But, this spirit of thorough candid understanding between superior and subordinate has a value beyond the mere settlement of difficulties. It is an essential for success in all phases of the work. It is easily acquired if a man realizes that his first obligation is to meet the wishes of his superior officer and if the superior officer is equally aware of his obligation to afford his assistant the maximum opportunity to develop the best that is in him. Neither can make a success of his job, unless they both subscribe to this simple truth."

But human relationships are not always the relation of superior to subordinate. Men have dealings not governed by well established lines of authority or rank. This was especially true of Mr. Safford's work as engineering assistant to Hale Holden, when regional director of the Central Western Region during the period of government operation. Yet he carried out a wide variety of assignments involving negotiations still more varied as to personnel with a facility that carried his point with a singular absence of friction or ill feeling.

This was manifested when he became chief engineer of the Grand Trunk where as one from a foreign country, he took charge of a department with which he had had no previous connection. Yet his relations with his assistants were always the best and the record of his seven years' service in that position speaks for the success which attended his dealings with the other officers of the road. There is a ring of sound logic in his comment on human relations.

"Nothing is more fatal to your dealings with others than an indisposition to give full weight to ideas they advance. An attitude of tolerance for their opinion is absolutely essential for the successful conclusion of negotiations involving differences of opinion or point of view. This is all closely related to the exercise of tact which, as I see it, is the observance of proper respect for the individual, his age, experience and position, for his ideas and prejudices. It also implies the presentation of your case with conviction, yet without seeming to force it upon the man you desire to convince.

"The necessity for the exercise of fair-mindedness and tact is nowhere more urgent than in the inter-department relationships of a railroad. In some lines of industry, departments may perhaps function with a fair degree of success without very close cooperation with the others, but in the railway business, almost no department can execute its plans successfully alone. There must be cooperation and this cannot be obtained unless those who take part in negotiations are willing to see the other man's viewpoint."

Motor Car Operation Costs Only 5 Cents per Mile

THE economy of motor cars is now so generally conceded that there is no longer any occasion for a tangible demonstration of the savings to be accomplished by their use. Nevertheless, figures showing the actual cost of motor car operation, as compiled on a railroad having nearly 700 of these cars in use, are of general interest particularly where the figures cover such a large number of cars and represent the average performance of 13 different styles of cars purchased from four different manufacturers. The mileage per car per year averaged 3,870, while the average consumption of gasoline per mile shows 22½ miles per gallon, but ranged from 15 miles to 42 miles, depending on the style and size of the car. The cars average 78 miles per pint of oil.

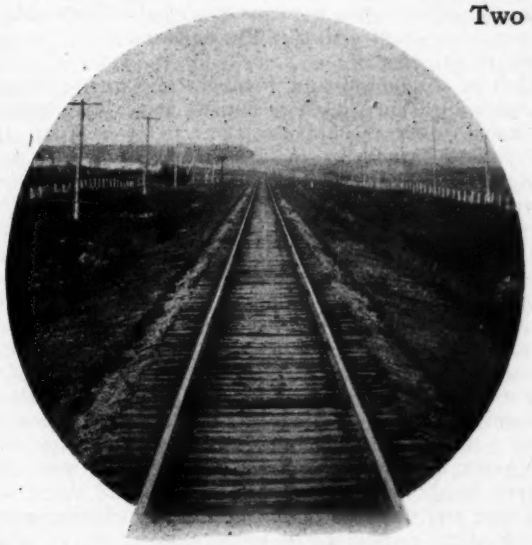
The total cost of operation for the cars, including interest, depreciation, operation and maintenance, averaged 4.8 cents per mile, 83 cents per day or $186.69 per car per year. With a cost of less than a dollar for the operation of the motor car per day, it is clear that a very small saving in the time of the men would more than compensate for the greater cost of motor car as compared with hand car operation. The itemized cost of motor car operation on the basis of cost per car per year and cost per mile operated is given in the table.

OPERATING RESULTS OBTAINED WITH 680 MOTOR CARS

	Annual Cost Per Car		Per Mile	
Interest on Investment at 6 per cent	.....	$ 18.00	.....	$0.0047
Depreciation at 8 per cent	.....	24.00	.....	0.0062
Gasoline	$39.60	.....	0.0102	.....
Oil and Grease	5.89	.....	.0015	.....
Batteries	5.34	.....	.0014	.....
Total Operating Cost		50.83		.0131
Repair Shop Expense	22.50		0.0058	
Supervision (field)	25.06		.0065	
Repair Parts	46.30		.0119	
Total Maintenance Cost		93.86		.0242
Total Cost Per Year		$186.69		.0482
Cost Per Car Per Day (225 days)		0.83		

Establishing Standards for Branch Line Maintenance

Two Discussions of the Principles Governing Appropriations for Roads of Light Traffic



NO PROBLEM confronting maintenance of way officers calls for the exercise of more mature judgment than the distribution of the funds available for maintenance between main and branch lines. On the one hand there is the tendency to restrict expenditures on branch lines to the point where safety of operation is endangered because of the limited earnings of these lines, while on the other hand there is a tendency to maintain the standards above those justified by the amount of business handled to conform with main line practices. The two discussions which follow treat this problem in a constructive manner and contain suggestions that will be of interest at this time when the season's programs of work are being carried out.

A Program for Light Traffic Branch Lines

By L. H. Bond
Assistant Engineer Maintenance of Way, Illinois Central, Chicago.

Every year since the advent of railroads when the maintenance season begins, the question of carrying out a branch line program comes up. Light traffic branch lines which are not on a paying basis are similar to the non-paying departments of other industries, those departments being secondary to the paying departments which receive the major share of supervision, material and labor.

The rail program is divided in three classes; first, main line, receiving the new rail and preference for ties, ballast and bridges; second, heavy branch lines, receiving No. 1 sawed rail relieved by the use of new rail in the main line; third, light traffic branch lines, which, with the exception of ties, takes the surplus if there happens to be any. Sometimes the allotment of ties for branches is less than the normal requirements.

On branch lines where the traffic remains about the same year after year, or decreases as the years go on, the program, as a rule, is about the same. The light rail laid on most branches when built seems to have an indefinite life, and we sometimes wonder whether something was not put in this rail that the present day rail does not have. A general inspection of rail should be made twice each year, in the spring and fall, and all defective rail removed. Recommendations for relieved, sawed rail of a heavier weight, or for rail in kind, can be made from the fall inspection.

All rail lines must have an adequate supply of ties; otherwise they cannot be operated safely, the number of ties required being determined by a separate count made by the foreman and the supervisor, the division engineer making a count on such portions of the line as will insure accuracy.

After ties and rail, labor is the most important factor of branch line maintenance, two or three men, as conditions require, being allowed for each section. Ordinarily, gangs on branch lines are more efficient than those in regular main line service because of size and permanent employment. The turnover in large gangs decreases their efficiency and they will never compare with the gangs in branch line service.

In the old days most of the branches were maintained on "dirt" ballast, which was rough in the spring when the frost was leaving the ground in the north, and during the rainy season in the south. Cinders make first-class ballast for branch lines, and when applied in sufficient quantities, say six or eight inches under the ties, will improve riding conditions more than any other one thing, and will practically eliminate the necessity for cutting weeds from the track section, thereby releasing labor for other and more useful work on the track and structures.

Ditching and banking come second to ballast. Once a branch has been brought up to a reasonable standard, the track can be maintained in better condition and the force reduced, but in order to have proper maintenance adjustment on branch lines they must be well ballasted, ditched and banked. Too little or too much of these important items is wasteful.

For bridges on light traffic branch lines, authority should be obtained for each structure, the work to be done on them being determined by a general inspector in company with division officers, and a final decision being rendered later at a budget meeting held in the general office.

The division engineer is responsible for the maintenance of his division, and, to a large extent, his judgment is relied upon in determining what is needed. Each fall the division officers are called upon for their recommendations for the ensuing year, and are cautioned to furnish accurate and detailed information.

The foregoing shows the care that must be taken to establish a general program for the items that enter into the maintenance of branch lines. Work chargeable to the other accounts, fencing, crossings and signs, stations and other buildings, shops and all other miscellaneous items, should be determined in much the same manner. Such a program may mean much or little. Financial conditions, weather conditions and the like play an all-important part. Shortages of material and labor, together with urgent work on more important lines, interfere with the

program and often cause it to be changed or cut down to such an extent that it becomes unrecognizable, the general plan rarely being followed to a conclusion. Often the branch does not pay a reasonable return, and improvements of a permanent nature are not justified, regardless of the fact that repairs are more costly in the long run. It can readily be seen that a carefully worked out program may be deviated from to such an extent that even the time spent in working it up is almost entirely wasted.

A well worked out program is the most economical in the long run and is the only method by which the best results can me obtained for the least money. If a regular program could be carried out each year, the results would be surprising. The expense for the first few years might be above the general average, but this would be adjusted in later years. From all indications we will pursue the same course in regard to light traffic branch line maintenance as in the past, make a program and adhere to it as far as possible, endeavoring to bring these lines up to a standard of maintenance in proportion to their importance.

Better Standards of Branch Line Maintenance for the Same Money

By H. R. Clark
District Engineer Maintenance of Way, Chicago, Burlington & Quincy, Lincoln, Neb.

With a limited amount of money and a curtailed allotment of men at his disposal, such as has been all too common on many roads for several years, the man on whom the responsibility rests for the use and distribution of such money and men faces a serious problem. On the correct solution of this problem depends his success as a maintenance officer, and equally as important, the well-being and success of the road he serves.

There is a fairly well defined and recognized standard which must be maintained on the main lines and more important branches. Too often the tendency is to adhere to this standard on such lines at the expense of the light traffic branches.

In determining how far such a policy may be carried, safety of operation must not be lost sight of. It should also be remembered that in many cases the branch line is the only line serving a number of towns and communities, and is therefore, very important to them. Irregular and seemingly unnecessarily poor service, very quickly creates an unfriendly spirit towards the line, which is reflected in an antagonism to all railroads.

Another point to be considered is the possibility of reducing the cost of operation of any line by a higher standard of maintenance. Operating costs might be reduced quite materially by an improved standard of maintenance which would permit increased speed. A larger tonnage per train made possible by greater speed, especially on lines where tonnage is governed by comparatively short grades on which momentum is a feature, also enters into the possibilities. In this discussion no consideration is given to the possible use of heavier power that might be allowable due to better maintenance. That is an altogether separate study.

To me it seems that the problem resolves itself into a consideration of how we may have better track for almost the same expenditure, not how it is possible to have as good track for less money. This is especially true under conditions as they are at present and have been for some time. The expenditures allowed have reached the minimum. The job of the maintenance engineer is to get the most out of what he has.

It is generally conceded and recognized that some things that are good for main line maintenance are also good for branch line use. In this class we might place treated ties and bridge timber, motor cars and to some extent other labor-saving devices. In fact motor cars made their record and established their usefulness on branch lines, and when treated ties or timber are standard on main line, very generally ties and timber for branch lines are also treated.

If it is economical and good practice to use treated ties on branch lines, it seems entirely logical that equally favorable results would be obtained by revising the standard of branch line maintenance in other ways and applying some of the devices that have proved their merit in main line service to branch line use. In this list we might include tie plates, rail anchors, ballast and heavier rail.

Every maintenance man, and I think every railroad officer, will concede the economy of using tie plates on main lines and grant, without argument, that plates add materially to the life of the tie. If this is so on lines where we have a rail base between 5 and 6 in. in width and a tie with at least an 8-in. bearing surface, it certainly is more necessary to protect the tie when we have a rail base a little over 4 in. wide and a tie with a 5½ or 6 in. face. It can easily be seen how many less square inches of bearing surface there are under the rail base and, therefore, the extent to which the sawing action of the rail on the tie is increased.

It is true that the number of cars handled on such a line is less than on the more important lines, but few branch lines today have a limit as to the permissible car load that may be handled, so as heavy loads are handled on the branch as on any other part of the road. The light rail does not distribute the load as the heavy rail does, so each tie receives a more direct and heavy blow. Inspection of almost any branch line will indicate the extent to which ties are being damaged and how greatly the annual renewal is increased by mechanical wear.

In my opinion the rule for the use of plates on tie renewals should be the same on branches as on main lines. If every tie renewed on a main line is to have a plate applied, so should every tie on a branch line. I am sure that the longer life of the ties will more than justify this practice. Plates need not be as heavy or as large as those used on the main line, but they should be large enough to increase the square inches of bearing surface substantially. A 6 in. by 8½ in. plate is a good size for branch line service.

Anchors are needed in places on branch lines. The need is not as general as on heavy main lines, but on many light branch lines there are stretches of track, probably on grades and possibly not very long, where rail runs. Such places should be anchored. Even if a high standard of tie spacing, joint maintenance and surface is not required, a safe standard must be maintained and when rail runs extra work is required to do even this. Anchors will pay for themselves speedily.

On light lines at least, we still depend on the slot spiking of joints for anchorage. The slot in the angle bar used on light rail is generally such that it offers only a slight resistance to the movement of the rail. This increases the need of anchors.

The advantages and economy resulting from use of ballast on branch lines are so well known and generally recognized that argument is unnecessary. To be able to work track when it is rough and needs attention instead of being compelled to wait until it dries, as is necessary in dirt track, certainly tends to economy of both maintenance and operation, and to safety. Ballast also re-

tards the growth of weeds and vegetation and reduces expense of destroying them.

Without doubt we can have better track for the same money when we have ballast with which to work. Applying ballast to our unballasted lines involves a large capital account, and the extent to which such a program can be carried, depends on many things. One of these is availability of cheap ballast close at hand. A light branch does not require, nor would I advocate, as heavy and high grade ballast as a main line. Cinders make excellent ballast and for branch lines, cinders that are comparatively light, such as those from cinder pits, even when inferior coal is burned, are entirely suitable. These are to be had on every division and should be carefully distributed and used to the best advantage, in addition to such other cinders as can be secured without a prohibitive haul.

Six inches of such ballast under the tie is sufficient on most light traffic lines. The necessary study to determine the proper depth of ballast to apply and careful supervision to insure that the program decided upon is followed, are justified and necessary. Insufficient ballast under the tie, or the practice sometimes known as "galvanizing," is worse than none. We waste the money spent on such work and make future maintenance more expensive and difficult. On the other hand the use of too much ballast should be avoided as we not only waste the available ballast and so decrease the total distance we can cover, but the extra and unnecessary lift adds to the cost. It has been estimated that each inch of raise above that necessary for proper and economical tamping costs over $300 a mile.

Heavier rail is advocated by every maintenance man and most urgently of all by the men closest to the firing line. Twenty or thirty years ago, when our branch lines were built, 52 lb., 56 lb. and 60 lb. rail was suitable. Since then, even if the weight of power operated and the number of cars handled have not increased, and they generally have, the weight of the cars and loads handled has almost doubled. The weights of rail that should be used on lines of all classes have been given much study and consideration. The weight used on most branch lines, however, is determined by what is available. The general practice is to use second-hand rail released in main line relay on the light branch lines. Suitable rail is selected, straightened, sawed and laid. In this way it quite often happens that we use a heavier rail on some branch lines than the service and traffic demand. In this case such excess weight can be taken advantage of and partly offset by spacing ties a little farther apart and so decreasing the number of ties per rail. An inch farther apart means one less tie per rail or about 160 a mile. This not only means an immediate saving at the time, but an annual saving of ten ties a year in renewals, based on an average annual tie renewal of about six per cent. A reduction of ten ties a year means a saving of $20 to $25 per mile by the time the tie is in the track. This will offset, to a large extent, the additional capital included in the seemingly unnecessarily heavy rail.

Ditching on branch lines should also be considered carefully. In an effort to hold down maintenance costs, ditching is too often neglected. A small amount spent in ditching is often saved many times by eliminating other work that such ditching renders unnecessary. This possibility should be studied before it is decided to neglect or delay ditching work.

In a discussion such as this, no general rule can be laid down and no measure can be established as to the standards that should be maintained in line, surface and general riding conditions; this must be decided for each particular line and is, as a rule, determined by the amount and class of traffic handled.

In the above I have endeavored to point out a few ways in which our standards can be raised at little additional expenditure, or in other words, as said before, how we can have better track for the same money.

Engineers Study Timber Treatment on the Reading

APPROXIMATELY 70 railway engineering officers and others interested in the preservation of timber spent May 9 and 10 on an inspection of treated ties in tracks of the Philadelphia & Reading and the Public Service Railway in New Jersey, and an inspection of the timber preserving plant of the Reading at Port Reading, N. J. This inspection was organized to afford an opportunity to study the results which have been secured from the treatment of ties in various ways and with varying quantities of preservatives, with particular thought regarding the possibility of meeting the present shortage of creosote by a mixture of creosote and crude oil. The party was in charge of C. M. Taylor, superintendent

A Group in the Yard of the Port Reading Treating Plant

of timber preservation, and J. D. Landis, purchasing agent of the Philadelphia & Reading.

The morning of the first day was spent on the tracks of the Public Service Railway in the vicinity of Blackwood, Mantua and Woodbury, N. J., where several thousand ties treated with water gas tar oil were installed in sand and cinder ballast in 1911 and 1912. As far as the records of the railway show none of the more than 18,500 ties installed at that time have been removed for decay. The complete record of treatment of these ties is given in the 1917 report of the Committee on Wood Preservation of the American Railway Engineering Association. On the afternoon of that day, a test section of track near Stratford, N. J., on the Atlantic City Railroad, was examined. The ties in this section were treated by the full cell and empty cell processes, individual records being made of each tie and the amount of oil retained in it. These ties were laid in track in 1911 and 1912, since which time they have carried a dense high-speed traffic. On the following day, the party inspected several sections of track on the New York division between Philadelphia, Pa., and Boundbrook, N. J., including ties treated with creosote and also with zinc chloride. A section of track with treated Douglas fir ties installed out of face in 1921 was also inspected. The afternoon of the second day was spent in a visit to the treating plant where the treatment of ties with a mixture of 30 per cent grade B English creosote oil and 50 per cent California fuel oil, cut with 20 per cent of California gas oil, was observed. Opportunity was afforded for a discussion of the merits of this treatment and for an examination of the plant and of the timber seasoning in stock.

Report on Marine Piling Contains Valuable Data

VALUABLE information on the constantly increasing activity of marine borers is contained in the latest progress report made by the Committee on the San Francisco Marine Piling Survey in co-operation with the National Research Council and the American Wood-Preservers' Association. The serious character of this menace to maritime structures, and the steps being taken to combat it, are outlined as follows in the introduction to this report:

The world is now in one of the major waves of abnormal abundance of marine borers which seem to have occurred at about 50-year intervals since the first great attack of these organisms upon the dykes of Holland in the fifteenth century. The present epidemic occupation of the shores of North America by the destructive Teredo navalis of European waters, which was first evidenced in San Francisco bay, has steadily progressed during 1922 and is now causing most apprehension in the general region of New York harbor, where the National Research Council through its committee on Marine Piling Investigations has organized one of its chief campaigns. In that harbor the teredo has, during the year, become firmly established on both the Long Island and the New Jersey shores above a line across the Battery, and, although as yet less activity, in the harbor structures of lower Manhattan itself. Should the attack there continue to follow the history of that in San Francisco bay, as it so far seems to do and as from the first has seemed probable to the most competently informed members of this committee, the resulting catastrophe will be greater in proportion to the vastly greater total volume and concentration of structures subject to attack.

Insofar as the study of the action of borers on timber and piling is concerned, the work of the committee, as recorded in this report, has been devoted primarily to the discovery of basic scientific facts regarding the exact nature of the borers, particularly the teredo. The committee reports that, "gratifying improvement has taken place during the current year" in the methods of handling creosoted piles to prevent damage. With respect to the sheathing of piles with copper, the committee offers favorable report, but calls attention to the fact that the protection thus afforded is easily destroyed by either abrasion or theft.

Conclusions of the committee with respect to the action of sea water on concrete and the possibility of developing a type of construction capable of resisting such action, are also presented, from which the following abstracts are taken:

Proper curing is probably of more importance for air exposed than for sea water exposed structures. Concrete immersed in sea water cures and sets under ideal conditions. While it is preferable to leave forms in place in order to protect the surface from impacts, no detrimental effects have been observed resulting from early exposure to sea water, and, for facilitating special construction, exposure in 48 hours may be permitted.

Simple concrete structures, whether subjected to protected harbor exposure or ocean exposure, may be relied upon to resist sea water permanently if the concrete is intelligently mixed and deposited in accordance with the provisions of these specifications. The principal abuses to guard against are flooding the mix with excess water and failure to tamp and compact the mass thoroughly in the forms.

Tremie concrete should not be depended upon to resist sea water unless protected by an impervious outer layer of concrete or other material. It can be relied upon for structural loads in simple structures of mass type.

The principal cause for the disintegration of composite structures composed of concrete and reinforcing or structural steel is the rusting of the embedded steel under the accelerated corrosive action of the sea water. This rusting takes place above mean tide elevation, in that portion of the structure exposed to both sea water moisture and air. The action is increased by the use of porous concrete and by the formation of fine cracks under impact and tension, which assist the penetration of moisture and air. It is retarded and prevented by the use of dense, impervious concrete and by the sealing of cracks to prevent or retard penetration.

Embedded structural steel may be protected by giving a heavy coat of paint, so that the salt moisture cannot come in contact with the steel, but this decreases the bond. It is possible that a system of painting reinforcing steel which will not seriously reduce the bond may be developed; but with present experience galvanizing is recommended. The protective concrete coating for painted structural steel and timber should be reinforced against impacts with a galvanized wire mesh.

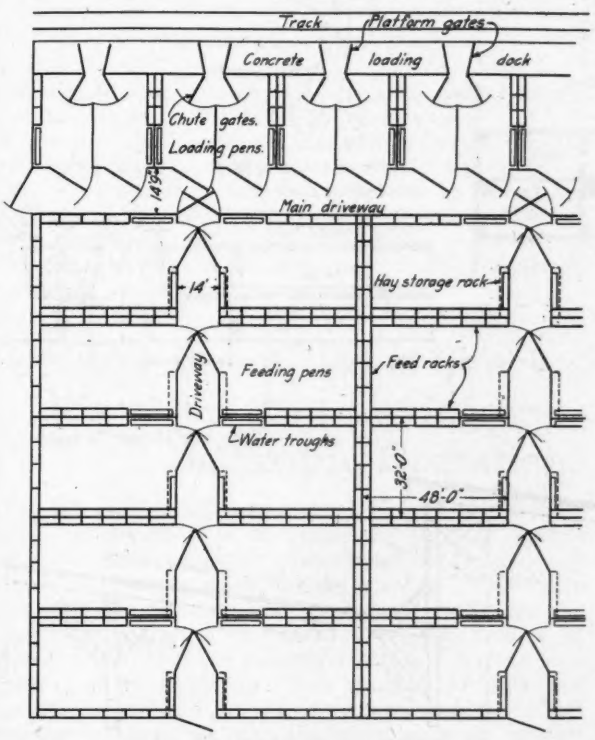
Encased structural steel construction painted with red lead and graphite on the steel and with asphalt on the surface of the concrete should be more durable than reinforcing steel construction. The question of a satisfactory coating for this purpose is still in the experimental stage and merits the attention and study of engineers.

Composite structures having an ocean exposure deteriorate rapidly above the tide line, even when constructed of high grade concrete. This is probably due to the heavy impacts of waves, which open cracks to the steel, combined with concentration of sea salts from repeated drenchings with sea spray.

New Union Pacific Stock Pens Embody New Features

Concrete Loading Dock and Watering Troughs are Among the Interesting Details in this Layout

STOCK PENS have long been considered such a conventional feature of railway facilities that, ordinarily, their design and construction do not merit any particular notice. However, this observation does not apply to the yards recently completed by the Union Pacific at Marysville, Kan., because of their size and the many features embodying distinct advancement in facilities of this character. Marysville is an important branch line terminal on the Union Pacific and the head-

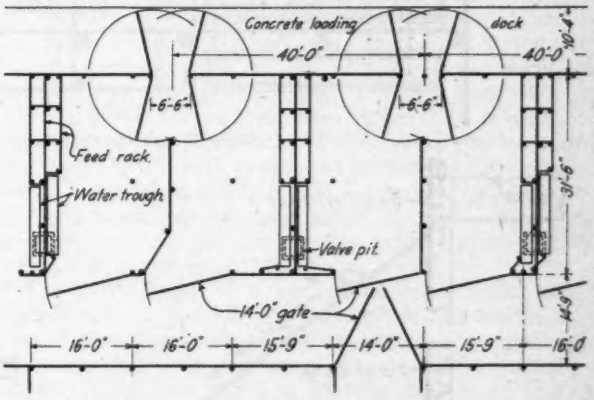


A Part Plan of the Yard

quarters of the Central division and comprises a convenient point for the location of yards for the unloading of stock for resting and feeding. The new facilities include an enclosure 204 ft. by 880 ft., equally divided between covered and uncovered pens and supplemented by auxiliary facilities, including suitable storage for hay and other feed.

The site selected for the yard is one where the ground rises on a gentle slope from the serving track, a condition of which advantage was taken in grading the site so as to depress the track a sufficient amount to bring the floor level of the cars even with the surface of the yard. The ground in the pens adjacent to the track is retained by a concrete wall of unique design. As shown in one of the drawings, it is set back from the track and provided with an overhang so that it affords a refuge for anyone caught on the track level when cars are being moved. The top of the wall is also extended to the rear in the form of an apron so as to provide a concrete platform 10 ft. wide between the stock pens and the track.

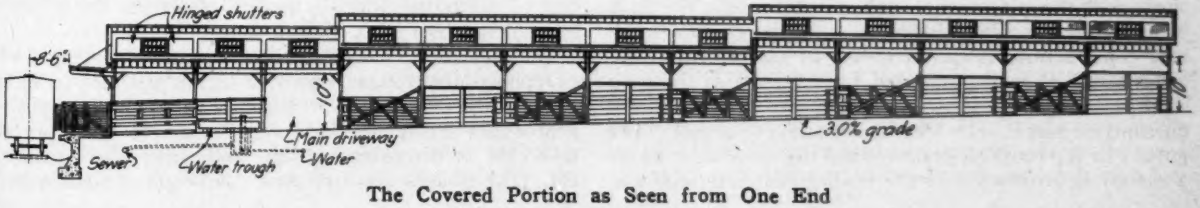
The yards, as arranged, consist of a tier of loading pens 30 ft. deep adjoining the loading dock or platform, but with the great bulk of the enclosure in feedings pens, the loading pens being separated by a main driveway 14 ft. wide extending the entire length of the yard. There are



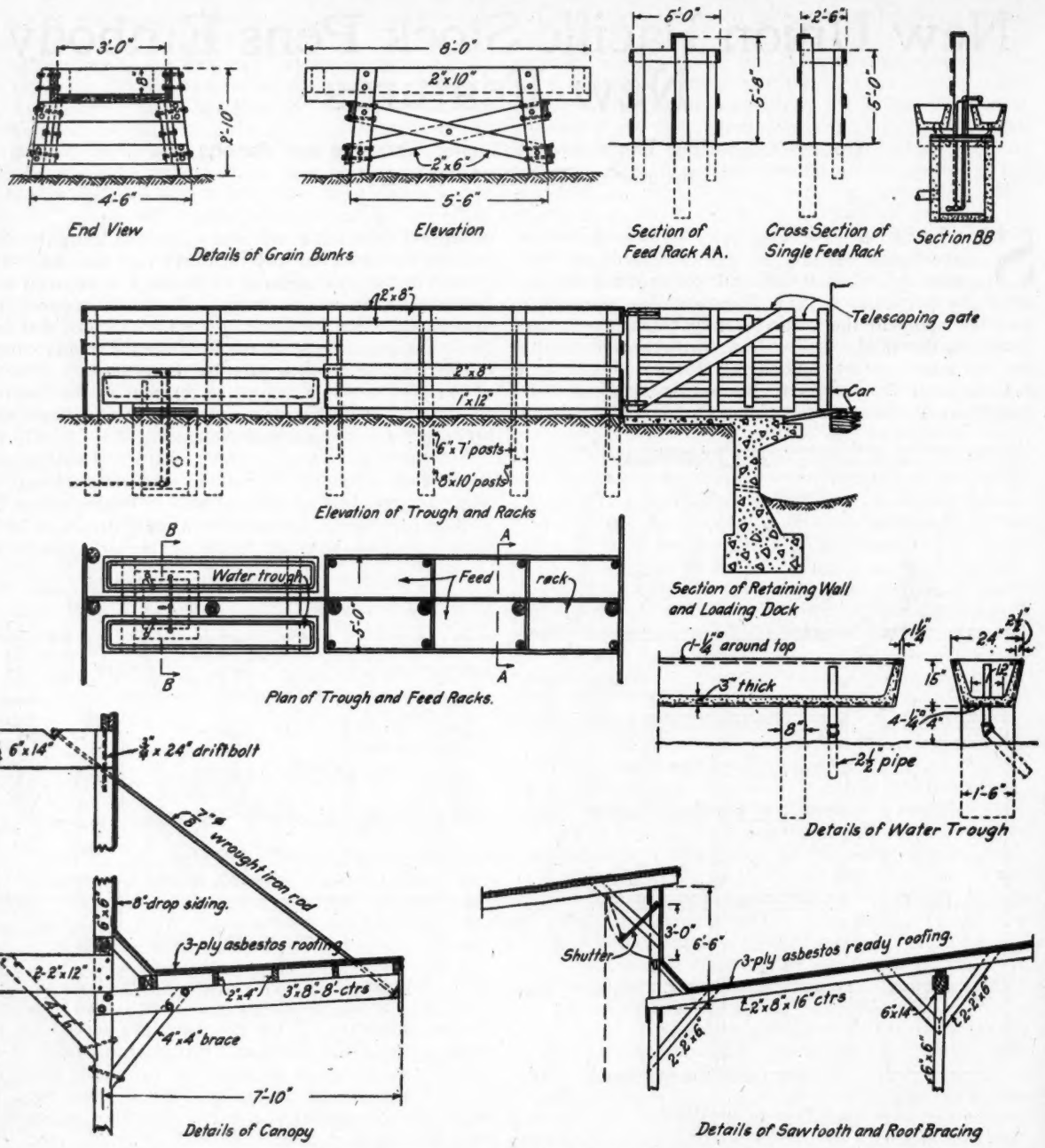
The Loading Pens

44 loading pens with an average width of 20 ft., these pens being arranged in pairs so as to be served by a single loading gateway. These gateways are served by two chute gates on the inside and two platform gates on the outside, affording an arrangement by which stock can be driven in or out of one or both of these pens, but even more important is the fact that this arrangement of gates makes it possible to load or unload stock cars without spotting the car doors opposite the gateways. This will be apparent from an examination of the large scale plan of the loading pens. There are 80 feeding pens, 32 ft. by 48 ft. in plan, arranged in 16 transverse tiers, five pens to the tier, the tiers being arranged in pairs on either side of transverse driveways connecting with the main longitudinal driveway.

The walls of the pens consist of a heavy fence construction composed of posts eight-inches in diameter and 10 ft. long, boarded solid with 1-in. boards to a height



The Covered Portion as Seen from One End



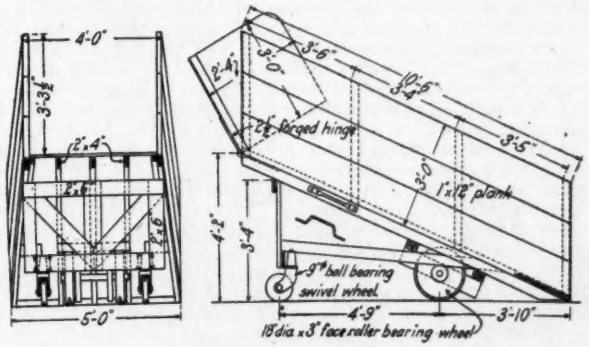
Many Interesting Details Were Developed

of 30 in. and finished at the top with 2-in. by 8-in. planks. To provide feed racks on all sides of the pens, these main walls are supplemented by lighter fences with 6-in. posts 7 ft. high set into the pens a distance of 2 ft. 6 in. These feed racks are omitted for a length of 12 ft. at one point in each pen to make room for water troughs.

One half of the length of the yard is provided with a roof, the construction being the same as for the uncovered sheds with the exception that the posts forming the main walls of the pens are carried up to support a saw-tooth roof construction, as shown in one of the drawings, but instead of the round posts used for the walls of the open sheds, 6-in. by 6-in. square posts are provided, supported on concrete piers. The roof construction is simple. The gutters of the roofs all drain toward the track side, where a canopy is provided over the loading platform with six-inch downspouts at intervals of 40 ft. in the gutter of this canopy. The vertical sides of the saw-tooth roof face the south and are provided with three panels in each span, a center one fitted with sash and two on each side with wooden shutters hinged at the top and opened by means of ropes and pulleys. The ends of the saw-tooth roof are sheathed with eight-inch drop siding, but the space below the roof is left open above the fencing, except to the north, which is sealed solid from the ground level to the roof with drop siding.

One interesting feature is the installation of reinforced concrete water troughs, one of which is provided in each pen. These troughs are arranged in pairs wherever practicable and are served by a single concrete valve pit to take care of the necessary inlet and outlet pipes, valves, etc. The troughs are supported at a height of four inches

above the ground level by means of concrete piers 8 in. by 18 in. in plan. In addition to the standard troughs provided for cattle, 10 of the feeding pens are equipped with hog troughs set underneath the cattle troughs in such a way that the same pipes serve both troughs. Twenty of the pens are equipped with portable grain bunks being



Portable Upper Deck Chute

wooden troughs 8 ft. by 3 ft. in plan supported on legs so that the top is 2 ft. 10 in. above the ground.

Another auxiliary feature is a portable chute for loading the upper decks of stock cars. As shown in the drawing, this is of timber construction supported on wheels and equipped with a tilting apron, providing a suitable extension into the car door. The floor of this chute consists of 1-in. by 4-in. boards laid in an overlap fashion to afford an anti-slip surface.

Uninterrupted Use of Track Expedites Rail Laying and Ballasting Operations

THE GREATER cost of track work, under the prevailing high level of wages, the alarming scarcity of labor, and the growing appreciation of the money value of labor are giving greater force to the necessity for full co-operation between the transportation and maintenance of way organizations in the conduct of track work. Also, the imperative necessity for the completion of all major operations on the track this year in advance of the season of maximum traffic places greater emphasis on the need of adopting all possible measures designed to carry out the work with the least expenditure of labor and in the shortest time. In view of this, there never has been a more opportune time for the consideration of the economy measured in both time and money, to be obtained through arrangements affording the uninterrupted use of track by the track forces during such operations as rail renewal and ballasting.

The practice of the Lehigh Valley in this respect is well known, but because the methods pursued on this road are more or less special, involving the use of more equipment than is generally available on other roads, there has probably been a tendency to consider the Lehigh Valley methods as not being generally applicable. However, other roads, for example, the Cleveland, Cincinnati, Chicago & St. Louis, and the Chicago, Milwaukee & St. Paul, who conduct their rail-laying operations according to the more commonly prevailing methods, have also found it of great advantage to release one of the tracks on multiple track lines to rail-laying and ballasting gangs, while the other track carries the traffic in both directions between the nearest available cross-overs on either side of the point where the track work is in progress.

An increase of 29 feet of rail per man per day in the progress of rail renewals, as a result of giving a rail relaying gang uninterrupted use of the track during working hours, is an illustration of the economies accruing from this practice. Even this figure, however, is not a full measure of the results obtained. It represents the difference between the average progress made by two rail gangs for nine days before they were given the full use of the track, and the average progress for ten days following the date on which the dispatcher was required to operate trains in both directions over one track at the two points, where these rail-laying gangs were at work.

With trains operating over both main tracks regardless of the work of the rail-laying gangs, the progress averaged 55 ft. of rail per man per day, while with the trains kept off the track, on which work was in progress, the average rate of renewal was 84 ft. The difference measures simply the saving in time which would have been lost while closing the track to pass trains some eight to ten times during the working period, and which enabled a gang of 60 men to lay 1,740 ft. more rail per day.

But the full advantage of this arrangement was not gained until several weeks later, when the reorganization of the work to meet the opportunities afforded by the improved working conditions resulted in a further increase in output of the gang, so that it ranged from 150 to 230 ft. of rail per man per day. Very little, if any, of this increase can be ascribed to increased efficiency of the gang, as the work progressed because of the exceedingly heavy labor turnover which prevailed throughout the entire season, for only about 12 men out of an average force of 120 for the two gangs stayed on the work during the entire summer.

The withholding of a section of main track from service did not result in any appreciable increase in the cost of train operation. With an average movement of 31 trains daily, the dispatcher was able to thread the trains through the two 6 to 10 mile sections of single track with practically no delay. As a measure to this end, special pains were taken to have the two gangs work 20 miles or more apart, and also to insure that they were not blocking the same main track on the same day.

Roads commonly following the practice of operating trains against the current of traffic on double-track lines, whenever these exigencies of traffic demand, are generally equipped with both left-hand and right-hand cross-overs at intervals of 10 to 20 miles. Obviously the presence of the left-hand cross-overs greatly expedites the transfer of trains to the left-hand track when passing around a gang. However, one railroad overcomes the absence of these left-hand cross-overs by providing its rail-laying and ballasting gangs with a complete cross-over of this kind, which is installed temporarily at the nearest telegraph station in the rear of the point of operation, so as to make it unnecessary for trains to back across a trailing cross-over.

The degree of protection afforded to trains on a double track railroad while operating over a short section of single track, varies with the circumstances such as the density of traffic and the extent to which operation against the current of traffic comprises a departure from the prevailing practice on the road. In some cases it has been considered necessary to pilot trains through the single-track section, but on the roads which normally sanction operation against the current of traffic as a means of expediting train movements, no such measures

are considered necessary In order to shorten up the section of single track, it may sometimes be necessary to install a temporary operator at a cross-over where ordinarily no operator is provided, but the expense of this is small as compared with the saving to be accomplished in the track work.

The release of the section of one track in a multiple track line to uninterrupted use by the maintenance of way forces, is not as formidable as it may seem at first thought. Nor is it necessary to carry out this expedient in an inflexible manner that will interfere seriously with train movements under extraordinary conditions. For example, near important terminals where a large number of passenger trains are arriving or leaving in the early morning hours, the track may well be left in service until the heavy train movement has been disposed of. Again at some point midway between terminals where a large number of meeting points occur within a relatively short period, as for example during the noon hour, the track may well be closed up until these trains are out of the way. However, unless such arrangements are watched very closely there may be a tendency on the part of some dispatchers to consider every extraordinary movement of trains as an emergency for which they can call on the extra gang foreman to close up the track. The point to be driven home to the transportation officer in connection with this practice is the opportunity which it affords for getting the work out of the way before the period of maximum traffic is at hand.

In obtaining this advantage in the expedition of maintenance of way operations from the operating department, the maintenance of way officer should bear in mind that he is charged with the responsibility of making the most of the time when the track is placed in his hands.

Illinois Has Adopted New Highway Crossing Rules

THE ILLINOIS Commerce Commission has recently adopted a set of rules and regulations relative to the construction, maintenance and protection of highway crossings in the state and the removal of obstructions to the view of approaching trains. They are based upon a study of previous legislation involving crossing protection and were enacted with a view to providing for greater safety to the public at such points. Prominent among the regulations is a rule forbidding the installation of advertising signs within 50 ft. of any crossing warning sign, also a rule requiring that where crossing gates are in service they shall be maintained for the entire 24 hours except where there is no traffic on the railroad for a period of at least six hours, in which case the gates may be left unattended during that interval.

The following is an abstract of the rules adopted:

Rules prescribing minimum clearances applicable to tracks, structures, fixtures and other appurtenances of "railroads" and "street railroads."

Signs at Grade Highway Crossings—Standard Railroad Crossing Signs.—Every railroad operating in Illinois shall erect and maintain in a conspicuous place at every public highway crossing at grade on its line or lines in this state, outside of incorporated cities and villages, whether designated extra-hazardous or not, on both sides of the tracks (except when otherwise ordered by the Illinois Commerce Commission) within its right-of-way lines crossing signs of such type and design as may now be used and maintained by it at such crossings. Such signs shall have painted on each side in capital letters, of at least the size of nine inches each, the words "RAILROAD CROSSING," or "LOOK OUT FOR THE CARS."

Stop Signs at Extra Hazardous Crossings.—When directed to do so by the Commission every railroad operating in Illinois shall erect and maintain such stop signs as the Commission shall determine are necessary on both sides of every public highway crossing at grade, designated as extra-hazardous by the Commission, provided that at all public highway crossings at grade designated as extra-hazardous on one side only such stop signs shall be erected and maintained on that particular side only.

Approach Signs at Extra Hazardous Crossings.—When directed to do so by the Commission every highway commissioner in the state of Illinois shall erect and maintain at every highway crossing at grade in his district designated as "extra hazardous" by this Commission, approach signs alongside the roadway at distances of 300 ft. on each side, provided that at all public highway crossings at grade designated as extra hazardous on one side only, such signs shall be erected and maintained on that side only. Such signs shall be erected upon a substantial post or pedestal at a height of approximately five feet above the level of the highway at the point where such sign is located and shall be located not less than three feet or more than five feet from the traveled or graded portion of the said highway.

No advertising or other signs shall be placed upon the highway or upon the railroad right-of-way within 50 ft. of any sign required by law to be placed at or near grade crossings.

Gates at Grade Crossings.—Hereafter wherever crossing gates are installed at a grade crossing where any street or highway is crossed by the track of any railroad such gates shall be maintained and operated for the full period of each 24 hours; provided, in cases where it is absolutely certain that there will be no traffic on the railroad for a period of at least six hours in any 24-hour period, the gates in such cases may be left without an attendant.

Construction of Crossings.—Every railroad shall construct every new highway crossing at grade in this state, and shall reconstruct every existing highway grade crossing other than improved hard road so that the planking or other materials shall be flush and level with the top of rails, not only between the rails of each track involved, but between tracks, and for distances of at least 16 in. beyond the outside rails. The planking or other materials in every case shall be not less than 18 ft. in width measured at right angles to the center line of the highway, and in the case of crossings located on highways improved with hard surfaces the planking or other crossing materials shall be not less than 30 ft. in width. In every case where the traveled or graded portion of a public highway immediately outside of right-of-way lines exceeds 18 ft. in width, the crossing thus rebuilt shall have a width at least as wide as such traveled or graded portion, the center of the crossing to be coincident with the center line of the highway.

Approaches to Grade Crossings.—Except when relieved by the Commission every railroad shall hereafter construct the approaches to all new grade crossings so that the grade of the approaches shall not exceed one per cent for the first 25 ft. each way from the track rails, beyond which the said approaches within right-of-way lines shall be on grades not to exceed three per cent. The top surface of the approaches to all public highway crossings at grade shall be maintained at a uniform elevation and at a width of not less than the traveled or graded portion of the highway immediately outside of right-of-way lines; provided, that no such approaches shall be constructed with a top width less than 18 ft.

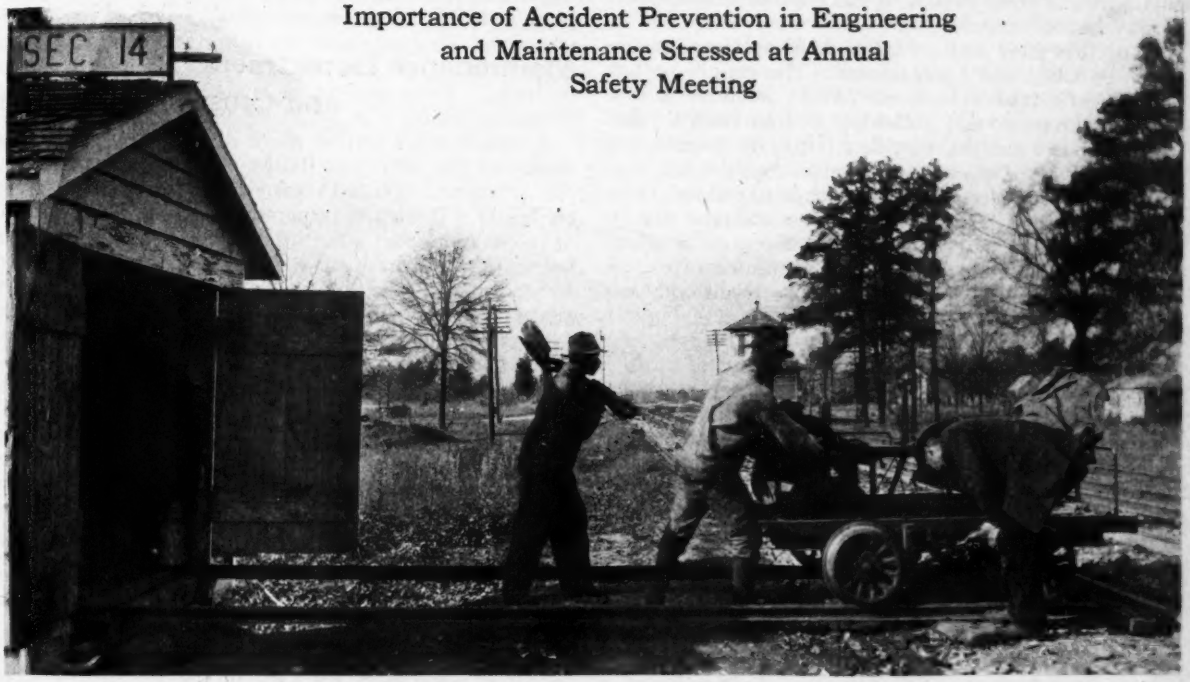
Removing Obstructions to View on Right-of-Way at Grade Crossings.—Except when relieved by the Commission every railroad shall remove from its right-of-way at all grade highway crossings all brush, shrubbery and trees, together with such other obstructions to view as in the judgment of the Commission should be removed, for distances of not less than 500 ft. in each direction from every such grade crossing.

On Public Highway at Grade Crossings.—It is recommended that every highway commissioner shall act with diligence in removing, or causing to be removed, from the highways within 300 ft. from each side of every public highway crossing at grade within his jurisdiction, all removable obstructions to view at such grade crossings, such as brush, shrubbery, weeds, etc., and shall cause to be trimmed, all hedges and trees upon the highway, or on line fences overhanging the highway, at such crossings for distances of not less than 300 ft. each way therefrom.

Growing Crops on Right-of-Way.—Every railroad is prohibited from planting or growing, or permitting to be planted or grown, any crops on its right-of-way within 500 ft. each way from any public highway crossing at grade on its line, which in any manner will obscure the view of approaching trains to highway traffic.

Safe Practices Promote Efficiency

Importance of Accident Prevention in Engineering and Maintenance Stressed at Annual Safety Meeting



The Careful Foreman Inspects His Car Before Leaving

THE SAFETY section of the American Railway Association met in its third annual convention at St. Louis, Mo., on May 24, 25 and 26, with about 140 safety officers from the United States and Canada taking active part. During the meeting reference was made to the need of support in meeting what is looked upon as an alarming increase in accidents, in the engineering and maintenance of way department, and to the study of the cause, prevalence and prevention of accidents occurring within or because of conditions in these departments. Discussions of the number of train accidents resulting from defective track and structures and of rail handling and motor car operation, figured prominently in this connection. One of the papers presented is reproduced in part, as follows:

Train Accidents Due to Improper Maintenance

By E. E. Stoup

Division Superintendent, Chicago Great Western, Oelwein, Ia.

Only 16 accidents in 1921 were attributable to defects in bridges, trestles, culverts and tunnels, resulting in 7 injuries. There were no accidents attributable to failure of bridges or trestles to carry the maximum capacity for which they are constructed, and none for improper construction or insufficient maintenance of tunnels. Four accidents were due to structural defects or the failure of bridges, one to deficient maintenance of bridges, three to structural defects or failure of trestles, and two to improper or insufficient maintenance of trestles.

Ties and tie plates were responsible for 459 derailments, resulting, however, in only 11 injuries, while decayed and worn ties were responsible for 381 accidents. A total of 68 derailments were attributable to soft ties and poor quality of timber, being the result of poor inspection or false economy in the purchase of inferior ties.

There were 976 derailments due to rails and joints, resulting in 4 killed and 331 injured. Of these derailments 566 were due to broken rails, 7 to flow of metal, 1 to split heads, 42 to split webs, 9 to broken bases and 5 to other forms of failures.

A total of 43 derailments were due to rails spreading on account of being improperly spiked or braced, 8 to rails spreading because of joints loosely or improperly bolted, 149 to rails spreading from other causes, and 48 to rails giving way or causing accidents because of their worn condition. There were 44 derailments from broken or otherwise defective rail joints and 14 from improperly compromised joints or other compromise joint failures, making a total of 306 accidents from these causes.

These accidents could have been avoided by closer supervision and proper education of section foremen and men. There may have been cases where it was impossible to secure the material to protect the rails against spreading, but in most cases these accidents were due to a lack of supervision on the part of division officers.

There were 583 derailments attributable to frogs and switches. Classified, these were caused by broken or missing frog bolts, defective guard rails, missing or improperly placed fastenings, broken frog springs, loose or defective frog spring bolts, broken frog wing rails, broken frog points and other defects in frogs, lost motion in switches, broken switch lugs, bent or sprung switch points, broken switch points, worn switch points, loose head blocks, also broken or defective head blocks, broken or disconnected switch rods, bent or sprung switch rods, broken keeper latches, defective or missing electric appurtenances, loose spiked switches and other defects in, or improper maintenance of switches.

Under the head of miscellaneous accidents, 1,081 were

due to insufficient, excessive or uneven superelevation of track, improper alinement or surface, low joints, track settling, improper gage, imperfect drainage, excessive curvature and other defects in and improper maintenance of way and structures.

Altogether there was a total of 3,138 accidents, resulting in 98 killed and 1,466 injured. The greater portion of these could have been avoided by adopting a constructive program and following it from day to day. More time and thought must be given to the training and the supervision of the section foreman and, through him, the men. Every foreman must be made to feel and know his responsibility in his work; he must also feel that he has the confidence and support of the officers under whom he serves, and should be seen and instructed often, encouraged and helped in his work. The result will be a decrease in accidents.

Rail and Timber Handling Injuries Approach 8,000

In discussing the handling of rail, ties and timber, L. F. Shedd (C. R. I. & P.) quoted statistics of the Interstate Commerce Commission showing that in 1921 alone 8 deaths and 7,676 injuries were sustained by workmen in the track and bridge and buildings departments while handling these materials. In the majority of cases the injuries were sustained where men were employed in groups, the injury very often resulting from unsystematic procedure in performing the work, rather than from the injured man's own fault. While these injuries are not always permanent ones, they are usually of a more or less serious nature which often exert a demoralizing effect on the uninjured workmen, and otherwise cripple gangs or interfere with efficient work as well as subjecting the injured man to suffering or inconvenience. Interested and attentive supervision by the foreman himself while his men are handling rail, ties, bridge timber and other heavy materials, instructing the men where to stand, how and when to raise and throw, etc., will prevent many accidents. It is incumbent upon the foreman to understand the peculiarities of the men, their ability to grasp advice and to know whether they are capable of leading or must depend upon others to direct their movements. Where machinery is used in handling heavy materials it was suggested that regular and careful inspection should be made of all parts to find the defects that might give rise to injuries, particularly in view of the migratory nature of a certain percentage of most gangs, to see that the new men thoroughly understand the proper and safe handling of such equipment.

Automatic Indicators at Curves for Motor Cars

Numerous causes were assigned for the many accidents incident to the use of motor cars by engineering and maintenance forces. Among those mentioned is the faulty construction of some cars, resulting in the pinching or crushing of fingers between the handles and rail head while removing the cars from the track. On the Chicago, Burlington & Quincy, it was stated by F. B. Thomas (C. B & Q.) that these accidents have been eliminated by installing horizontal grab irons on the ends of the cars, cutting off the two middle handles and making the two remaining handles extensions of the upper instead of the lower sills of the car. Further causes assigned were the operation of cars by unauthorized persons (to which some of the same serious accidents are attributable and which are preventable, of course, by a more consistent use of padlocks on car houses), derailments resulting from motoring at excessive speeds, and collisions with trains. The St. Louis-San Francisco has installed small indicators at the side of the track and operated by the block signal circuit at the ends of a number of its curves.

Maintenance Department and Crossing Accidents

A second drive will be made this summer, under authority of the American Railway Association, to reduce the accidents at grade crossings, this campaign to begin on June 1. While the preparations include the assurance of coöperation from influential national organizations, the success of the drive, it was pointed out, will depend largely upon the help given by the maintenance of way officers and particularly by the track foremen. In this connection it was suggested that close attention be given to: (1) the inspection of all grade grossings; (2) the removal as far as practicable of embankment, shrubbery and other obstacles to view; (3) the maintenance of proper approaches to all crossings, with attention to drainage; (4) the maintenance of all crossings in satisfactory condition as to planks, spikes and surface; (5) care of crossing signs, and (6) the frequent examination of all gates with reference to their condition and operation and the inspection of all overhead structure.

Better Clearances Desirable

Insufficient attention to the provision and maintenance of proper clearances for cars in the vicinity of fixed structures, was also mentioned as a source of numerous deaths and injuries. In a paper on this subject J. F. Smith (M. K. & T.) stated that about 50 per cent of the accidents resulting from contact with fixed structures are attributable to structures that could and should have been made to clear a man on the side or top of a car before the injury occurred. The majority of structural hazards on railroads are on railroad property leased to private concerns or on private tracks where switching is done.

Some of the structures found in need of immediate attention on several roads are dilapidated, leaning buildings, fences and gates; doors and gates that open to foul track; telephone and telegraph poles; coal and sand bins, low bridges; low wires, pipes, etc. Not infrequently the track is found sufficiently low on one side to cause non-clearance by tipping the cars. Occasionally ropes are found missing from tell-tales. A very dangerous condition exists when a structure will clear properly at the entrance of a track or end of a structure, but will not clear farther along the track. This acts as a chute or trap for a man. Special attention should be given structures adjacent to tracks on sharp curves. The clearance should be sufficient to clear the center of car when long cars are handled. Ordinary clearance is not sufficient under such conditions.

Switch stands that do not clear 6 ft. 6 in. should be made to clear by extending the connecting rod. Where there is not sufficient room for this, ground throw switches without targets should be installed and equipped with lamp and target combined. Switch stands thus equipped will be 12 to 16 in. lower and will clear a man on the sill step of car. Many ground throw switch lamps will not clear at present. In some instances the track can be lined away from the structure easier than the structure can be moved into the clear.

All of the non-clearance signs that have come to my notice read—"Warning, Structures on This Track Will

Not Clear a Man on Side or Top of Car." There is no standard color or shape for these signs and no standard as to the place to locate them. Sometimes they are on a post at the turnout, sometimes on the structure that will not clear. If the sign is new and bright, it can be read, but when moving at the rate of 6 miles an hour, a man will travel about 50 ft. before he can comprehend its meaning. Long worded signs are not good. Something that can be seen and understood at a glance is what is needed.

Maintenance of Way Safety Committee Is Effective

One of the most prominent features of the meeting was the detailed description given of the safety organization of the Union Pacific, the account of which was received with particular interest, in view of the fact that this road established the best record of all Class 1 railroads last year in accident prevention work. On this road the division engineers hold monthly meetings of their track, bridge and building and signal employees at central points with the aim of having every man in the maintenance of way department reached by a safety meeting at least once every three months. H. A. Adams, assistant to general manager in charge of safety, stated with reference to these meetings that "they have done more to stop accidents than any other committee organization which we have. They reach a class of men who heretofore have been, to a great degree, overlooked. For this branch of the service we have adopted a new code of safety rules that has been supplied in book form to each foreman and foremen are held responsible for instructing employees directly under them. These books contain 86 rules printed in six languages. The division engineers prepare monthly exhibits for distribution over the entire railroad in order that the maintenance of way forces on each division can see what others are accomplishing. This creates somewhat of a friendly rivalry between the different divisions. At the close of each year the Safety Department presents a gold button to each foreman in the maintenance of way department if his gang has gone through the entire year without a reportable accident. Out of 139 foremen on one division 113 foremen were entitled to buttons last year. At the close of the present year it is also the intention to present meritorious service safety buttons to roadmasters. For those divisions where no roadmaster may have established a 'No Accident' record for the entire year, the presentation will be to the roadmaster whose district has made the best record of all the districts on the division. We find these little trophies accentuate this work to a great degree."

Hydraulic Rams Provide Water Supply on Canadian National

By L. H. Robinson
Division Engineer, Canadian National, Bridgewater, N. S.

THE Bridgewater division of the Canadian National is located in the Province of Nova Scotia and consists of 250 miles of main line between Halifax and Yarmouth and 126 miles of branch lines. The traffic is light. The controlling grades are 1.5 per cent uncompensated, or equivalent to about 1.8 per cent. In 1919 this division became a part of the Canadian National.

There were then 15 main line water stations. Four were supplied from muncipal mains, ten by five-horsepower combined gasoline engines and pumps, and one by a small hydraulic ram. The shortest interval between water stations was 13.4 miles and the longest 33.2 miles.

The capitalized cost of that part of the water service that admitted of possible lowering by the substitution of automatic supplies seemed about as follows:

Wages of three schedule pumpmen at about $100 per month	$3,600 per year
Wages of five contract pumpmen at $15 per month	900 per year
Wages of one schedule pump repairer at $175 per month	2,100 per year
Wages, keeping fires in tanks in winter months	250 per year
Coal for tank heaters	400 per year
Average cost of gasoline, kerosene oil and waste	900 per year
	$8,150 per year

The amount capitalized at 7 per cent to yield $8,150 per year is about $116,430.

A search was first made for possible gravity supplies, with no results. The next alternative was automatic supplies from hydraulic rams. The problem was to find streams: (1) With sufficient fall adjacent to the track to admit of ram installations, (2) With the water suitable as regards quality and quantity at all stages and seasons, (3) With locations such as would give suitable operating intervals between tanks and (4) With location that would not call for train stops on bad grades.

The scheme was worked out, approved by the management and construction completed early in 1923. There are now 13 water stations; four, as before, are supplied from town mains, eight by hydraulic rams and one, adjacent to a hydro-electric power line, by an automatic electric pump. The shortest interval is now 11.8 miles and the longest, 26.5 miles.

The summer of 1921 was one of the driest, locally, within memory, so that judgment could be formed as to the reliability of the streams in time of drought. The winter of 1922-23 had the most severe and sustained cold weather, so that the new ram installations were given a test as to their performance in below zero temperatures.

With the ram installations all pumping attendance is eliminated since the rams, after being finally adjusted, require practically no attention. The position of pump repairer was abolished. The electrical and signal departments arrange for a signal maintainer to give the one automatic electric pump the occasional care it requires. The ram installations require no fires in tanks in freezing weather. The rams work continuously, the tanks overflowing when full. The supply pipes in the tanks are made a few inches shorter than the overflow pipes, thus keeping the surface of the water constantly agitated.

The Rife Engine Company, New York, gave advice as to the ram layouts and supplied 13 of its No. 60 rams and 2 of its No. 80. These are mostly installed in batteries of two. The rams in a battery work independently

of each other, so that if one stops it does not affect the action of the others.

The best tanks from the pumping stations that were abandoned were shifted to the new locations. These were 40,000 gal. capacity unenclosed tubs. The new pedestals and the trestles as re-erected were built so that when the tubs require replacement, standard enclosed tanks could be built, if desired.

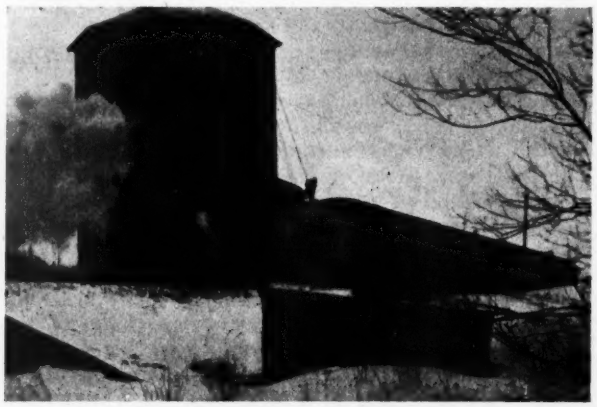
At Little East River, shown in one of the illustrations, the natural fall of the stream was used without change in the water levels. It was found cheaper to locate the ram-house some distance from the supply, bringing the water through a 12-in. vitrified clay pipe to an intermediate reservoir, situated the critical drive-pipe length from the rams. Each of the two rams is supplied from the reservoir with a separate 6-in. galvanized wrought iron drive pipe. At Allan's Brook an artificial fall had to be created by building a dam of old bridge timber. The rams are situated at drive-pipe distance from the supply. These two cases are typical of the installations made.

One of the illustrations shows an installation at Shelburne, with a standard 40,000-gal. tank. The tank with

House Construction and Pipe Lines Between the Ram and the Reservoir

the pumping layout that this replaced was destroyed by fire. The ram house is in the foreground. A dam of old bridge timber was constructed up stream, using the railway embankment as wings, and with the crest sufficiently clear of the bottom of the girders to avoid damage from ice flow in times of freshet. A battery of two rams is located at drive pipe distance from the face of the dam. Each ram is served with an 8-in. galvanized wrought iron drive-pipe, passing under the embankment back of the abutment. A 12-in. vitrified clay pipe carries the waste water from the floor of the ram house to discharge at a suitable level. Each ram has a 4-in. delivery pipe and these are combined into one 6-in. galvanized wrought iron pipe which passes under the embankment direct to the tank. A 4-in. overflow pipe from the tank discharges up stream from the dam. Like most of the many rivers on this division, there is excellent trout fishing on this stream, and the railway was required to build a fishway. The driving head is 4 ft. and the pumping head is 49 ft. Each ram requires 250 gal. per min. and will deliver about 20,000 gal. per day.

The ram houses were made 12 ft. by 9 ft. by 10 ft. high, floor of concrete and walls of old bridge timber;



A Canadian National Train Taking Water at the Shelburne Installation

single board roof, covered with roofing paper, and with a hatchway. The intermediate reservoirs, when needed, were made 6 ft. by 5 ft. inside, with the floor and walls of old bridge timber, caulked to make them water-tight. An air space of one foot was left above the water surface and a false floor with hatch built. Then another air space and the roof with hatch. Both the ram houses and reservoirs were banked with earth.

The complete cost of making the ram installations averaged about $5,000 per station. This included a credit item from the stores department for salvage of the pumps released. The saving effected by the change works out about as follows:-

Capitalized cost of previous service			$116,430
Two water stations eliminated. Original cost $4,400 each. Maintenance repairs equivalent to renewal in 2 yr., or $733.33 per yr. capitalized			10,500
			$126,930
Cost of Present Installations—			
7 new ram stations at about	$5,000	$35,000	
1 automatic electric pump		2,900	
Cost of Operation of Electric Pump—			
Power	$400 per year		
Repairs equivalent to renewal in 12 yr	250 per year		
	$650		
Capitalized amount to yield	$650 per year	9,300	47,200
Capitalized saving			$79,730

Depreciation from the operation of the former gasoline engines and pumps would be more rapid than in the rams that replaced them, thus further increasing the above capitalized saving. The rams have few moving parts, require no lubrication, are mechanically simple, efficient and durable, and are practically "fool proof." It is said that rams installed in England over a century ago, when the device was invented, are still in operation.

Cutting Down Tie Renewal Costs

Careful Planning and Attention to Details Will Reduce This Large Item of Expense

MORE THAN 12 cents of every dollar spent for maintenance of way goes for the renewal of ties. This work constitutes one of the most important activities of track forces and makes the largest demand on their time. In nearly all parts of the United States and Canada this work is now actively under way. Discussions of this subject and particularly of ways in which the work can be systematized and the cost reduced are of particular interest and value at this time. For this reason, we present two articles on this subject in this issue. The first has been prepared specifically for this publication by G. S. Crites, division engineer, Baltimore & Ohio, Baltimore, Md., who prior to his appointment as division engineer was identified with the operation of the standard track work system on that road, in which capacity he gave special attention to the systemization of maintenance operations to develop the most efficient way of performing various operations and to secure the maximum output with a given expenditure of labor. The second article is an abstract of a paper prepared by J. E. Jacobs, section foreman on the Kansas City Southern at Mansfield, La., and presented before the Maintenance of Way Association of that road at Shreveport, La., on April 14.

A Definite Plan Important

By G. S. Crites
Division Engineer, Baltimore & Ohio, Baltimore, Md.

A definite plan of procedure covering the season's tie renewals must be worked out far enough in advance to insure the minimum use of cars for loading, train service for handling and labor for putting in. The first thing to do is to determine where and how many ties are to be renewed. An inspection of all cross ties and switch ties in the track should be made by the roadmaster or supervisor, as early in the season as conditions permit, and a written record, by locations, miles, or other available intervals, made of ties to be renewed. This record should be in the hands of all concerned so the receipt of ties may be arranged for and the distribution properly planned.

Distributing

The most economical manner to distribute cross ties is to have the daily loading from the tie plant or other source of supply come to a point from which way freights, supply trains or work extras are to handle them for unloading and organize a gang or gangs to drop the ties at the closest available spot to where they are to be put into the track. The organization must depend on circumstances, for no hard and fast rule can be set.

Switch ties should be so loaded and marked that ties of the proper lengths can be unloaded at or adjacent to each turnout needing ties without handling any other lengths. This can be done by stripping between sets for each location in rotation. On the line of road way freights or supply trains can best handle them, whereas in yards spotting of the tie cars adjacent to the locations of use is economical. The organization for handling the unloading depends on varying circumstances.

Renewals may be made when track is not raised (ties will be "dug in"); while a raise is being made or after a raise is made and the track is more or less skeletonized. No discussion is in order as to the merits of these three methods, as circumstances govern the determination of the method which should or should not be used in each case.

Men work in pairs when renewing ties in a track that is not being raised. The ballast between the tie being renewed and one of the adjoining ties should be removed to a sufficient depth to permit sliding the old tie sidewise into the excavation and removing it from the track. The old bed should be dressed down sufficiently to permit placing the new tie without raising the track. To avoid having the new tie get loose and thereby throw the load it should carry onto the adjacent old ties, the new tie should be tamped well under both faces to the outer end of the tie and 18 in. inside of the rail. If tie plates are used the tamping should be done without the plate or with only a part of the wedge of the plate between the rail and the tie so that the rail may be sprung a fraction of an inch when the plate is placed, thus insuring a fair seating of the plate on the tie, and a solid foundation for the tie. If tie plates are not used, the rail may be lifted a fraction of an inch while the tie is being tamped. Pinch bars rather than jacks should be used, as there is a tendency to disturb the surface of the track when jacks are used. The size of the gang or the qualifications of the men in the gang will determine whether each pair should do the spiking, or whether other men should follow up with this.

Pick the Best Men

When ties are to be renewed while a raise is being made, spikes are drawn on the ties to be renewed. As the track is raised, the old ties are drawn out with picks. New ties are slipped in with tie tongs and then held against the rail and spiked. Tamping is done along with old ties, the men working in pairs. Unless traffic is very light, it takes sizable gangs to carry on this method of renewals and picked men should be assigned to the different operations.

When ties are renewed after a raise is made, spikes are drawn and sufficient cribbing out done to permit the ties to be moved sideways in the crib and drawn out. The bed is then prepared and the new tie inserted, held up for tamping and then spiked. A man or men are assigned to draw spikes, depending on the size of the gang, and the remainder of the gang should work in pairs. It is possible to mark the ties that individual pairs should work on and thereby engender rivalry.

Switch ties may be renewed singly or in sets. When renewed singly, all cribs of ties to be renewed should be cleaned to a level below the bottoms of the ties, the old tie slipped into the crib and drawn out, the bed prepared and the new tie pulled into place, spaced properly and spiked to gage. The tie is then tamped. The gang should be so separated that the work will go on smoothly and men not be in each other's way.

When switch ties are renewed in sets, the turnout should be skeletonized, either by cribbing out or by lifting, spikes drawn from every other tie and the track jacked up. The old ties are then withdrawn, the new ones installed, fully spiked and tamped lightly. The remaining ties should then be renewed in like manner, the men

working in pairs and two pairs working together on the longer ties.

In conclusion, it is to be said that the results to be obtained will depend primarily upon the programming and laying out of the work by the supervisor or roadmaster and the foreman in order to insure a fixed line of procedure, and then on the extent to which the progress of the work is followed carefully to keep a check on the efficiency.

The Proper Use and Handling of Cross and Switch Ties

By J. E. Jacobs

Section Foreman, Kansas City Southern, Mansfield, La.

Every foreman should know the number of ties required to make the renewals on each mile of his section. He should also know the number on hand and their location before he begins to unload and distribute the new ties.

The best method of distribution is, I believe, from cars handled by local freight. Adjoining section forces should assist each other in unloading the ties. Two section gangs of four men each will probably be sufficient, and these men should meet the train at the point where the unloading is to begin. A written line-up showing the different points where the ties are to be unloaded should be furnished the train crew. The section foreman should get on the top or the side of the train and check the ties as they are unloaded, each foreman checking one side of the train. When the desired number are unloaded at each location, proceed to the next place.

It is a good plan to place a couple of ties near the track at each point where ties are to be unloaded, and advise the engineer that he is to stop or slow down at these places. If this is done, he will not run by any point where it is desired to unload ties. In the interest of safety, it is a good plan to have two men follow the train on a hand car, to move back any ties that have fallen too near the track in the unloading, and to carry the forces back when the unloading is completed. Ties should not be unloaded in narrow cuts, and especially if they are to remain there any length of time, they should be unloaded at the ends of the cuts. After the ties are unloaded the foreman should count the number he has received and make a memorandum showing how many he has on each mile, both on hand and just unloaded.

If the ties are to remain on the ground for any length of time they should be stacked, but I am not in favor of covering them with dirt on any territory where oil burning engines are used, because if the ties are covered with dirt for a year and go through the winter and spring rains, the top layer will depreciate as much as in the track, so far as decay is concerned.

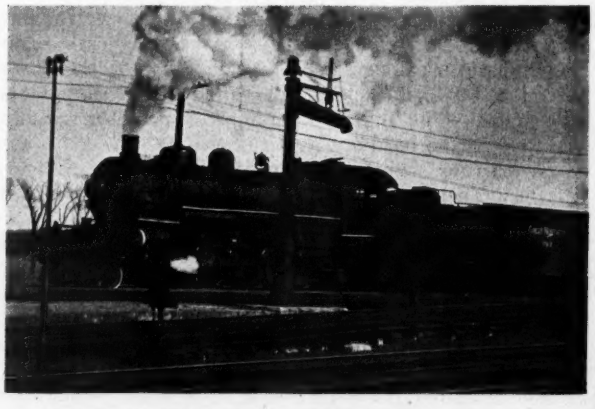
The roadbed condition should be considered when distributing ties for insertion. The best ties should be placed in soft spots, on curves and in public crossings. It has been my practice so far as possible to select heart pole ties for soft spots and public crossings. I prefer the butt cuts as they are a much better grade of timber than the top of the tree, having less sap and being much tougher. I prefer well seasoned pole white oak ties for public crossings as they do not rail cut as fast as treated red oak ties. A treated red oak tie seems to get soft and spongy when covered with plank as in a public crossing.

Ties should be properly spaced when inserted in the track, to equalize the load they have to carry. The track should be put in proper gage to equalize the holding power, and to prevent undue strain on a few ties; if this is not done, it will soon be necessary to regage the track. In some cases it is necessary to adze the ties and reset the spikes, both of which tend to shorten the life of the tie. Rails and tie plates should set flat on the ties; spikes should be driven straight down into the ties in order to obtain the full spiking strength.

I believe the best method to follow in making the renewals is governed by the conditions. Where there are four or five to the panel to renew, I prefer to surface them in, especially if the track is in the least center bound, or inclined to be rough. All the ties will then have an equal bearing, and the track rides and looks better. Where the gage, surface and line are good, with only a few ties to come out, I favor spotting them in. I think one of the best ways to spot in ties, under ordinary circumstances, is to take two jacks, spring the rails up a little, cut the ballast away from the ends of the old ties, and pull them out. When a little tie is pulled out, a small tie should be selected to take its place; likewise with a large tie. If the old tie is badly rail cut or has a few large knots, and you can't spring the rails enough without humping the track, pull the spikes from the ties on each side of the old tie. I favor any method rather than digging them out, for one of the most expensive methods of making tie renewals is to dig them out; not only does it require more man hours per tie, but it injures the roadbed, and it is hard to keep the new ties from churning. This condition, if allowed to continue, will cause extra work, and probably additional renewals, if the ties on each side of the churning ones are not very good, as they will be forced to carry too much weight.

I favor putting in new ties about ¾-in high, if shovel tamped. If the ties are tamped with bars or tamping picks, ½-in. is sufficient. In gravel ballast, it is well to tamp the ties before spiking them, if the gage is good and only one or two ties are renewed in a place—not more than two, especially if the steel is tight, and on curves—then allow a few trains to pass over the track, when they will be in good shape for spiking without having to nip them up. In stone or crushed rock, I believe solid tamping on a level is best.

Some thought should be given to the old ties removed. They should not be piled for burning under telegraph wires, or near telegraph poles, fences, bridges or buildings. Every precaution should be taken in the burning of the ties. The piles of old ties should be fired in the morning, when conditions are suitable, and should be given close attention. About noon or shortly thereafter, the burnt ends should be bunched together to make a clean job, and to be certain that the fire cannot spread. Fires are expensive, and there is always a cause for them.



Heavy Traffic Calls for Adequate Water Service

Labor Board to Consider Applications for Wage Increases

Agreements Between a Number of Railroads and Their Employees Have Led to Numerous Advances in Rates

THE GENERAL upward trend of business conditions in this country with the consequent tendency toward labor scarcity has had its effect on wage rates and has led to numerous requests for wage advances. Among other cases now before the Labor Board arising as a consequence of disagreement between the railroads and their employees in connection with requests for advances in wages, are cases involving the Brotherhood of Maintenance of Way Employees and Railway Shop Laborers with respect to negotiations for increased wages for maintenance of way employees on some 30 roads, including the following:

Chicago & North Western.
Chicago Great Western
Chicago, Indianapolis & Louisville.
Chicago, Rock Island & Pacific.
  Chicago, Rock Island & Gulf.
Chicago, St. Paul, Minneapolis & Omaha.
Cincinnati, Indianapolis & Western.
Denver & Rio Grande Western.
  Rio Grande Southern
Duluth, South Shore & Atlantic.
  Mineral Range.
Fort Smith & Western.
Green Bay & Western.
Gulf & Ship Island.
Illinois Central.
  Yazoo & Mississippi Valley.
  Chicago, Memphis & Gulf.
Kansas City Southern.
  Texarkana & Fort Smith.
  Arkansas Western.
  Port Arthur Canal & Dock Co.
  Poteau Valley.
Kansas, Oklahoma & Gulf.
Louisiana & Arkansas.
Louisville & Nashville.
Louisville, Henderson & St. Louis.
Midland Valley.
Minneapolis & St. Louis.
Minneapolis, St. Paul & Sault Ste. Marie.
Minnesota & International.
  Big Fork & International Falls.
Missouri Pacific.
Nashville, Chattanooga & St. Louis.
Northern Pacific.
Pittsburgh & Shawmut.
San Antonio & Arkansas Pass.
San Antonio, Uvalde & Gulf.
Terminal Railroad Association of St. Louis.
Texas & Pacific.
Texas Midland.
Toledo, Peoria & Western.
Trinity & Brazos Valley.
Western Pacific.

While there is apparently some variation in the demands as affecting different railroads, the general outline of the demands for wage increases is as follows: Eleven cents for section foremen and assistant section foremen, from 11 to 15 cents for bridge and building foremen, and assistant foremen, 14 cents for mechanics in the maintenance of way department, 8½ cents for mechanics' helpers and 15 cents for track laborers.

In the meantime, some 30 railroads have arrived at definite agreements with their employees in the maintenance of way department, providing for advances to become effective without review by the Labor Board. These advances vary over rather wide limits, as shown in the table. Subsequent to the preparation of this table the Rock Island has announced advances as follows: Foremen, $2.04 to $8 per month; mechanics, 2 cents; and laborers, 1 cent.

Maintenance of way employees on Canadian railroads are also agitating the matter of wage advances. In the case of track laborers this has taken the form of a request for an advance from the present rate of 36½ cents to a rate of 48½ cents per hour.

More Hearings on Pennsylvania Case

The United States Labor Board and the Pennsylvania Railroad are still at cross purposes with respect to the action of the railroad last year in organizing a company union of its shopcraft employees. The election under which the employee representatives were selected having been declared irregular by the Labor Board, a new election was ordered. This the railroad refused to carry out, as a consequence of which the Labor Board, in the absence of power to enforce its ruling, undertook the preparation of a public criticism of the Pennsylvania for its refusal to abide by the Board's decision. The Pennsylvania obtained an injunction from the district court restraining the Labor Board from issuing such a criticism, but appeal from the decision was made by the Labor Board to the Court of Appeals, which reversed the action of the lower court and the decision of this court was sustained by the Supreme Court in a decision issued February 19.

The determination of the Pennsylvania to adhere to its policy of dealing with organizations of employees limited strictly to its own lines has not been changed as a result of the Supreme Court decision, but the Labor Board has delayed the issuance of its statement censuring the Pennsylvania, presumably awaiting the reorganization of the Board following the appointment of members by President Harding as announced elsewhere in this issue. In the meantime, the trouble between the railroad and the board has been intensified by the presentation to the board of similar controversies concerning other classes of employees, including those represented by the Brotherhood of Railway and Steamship Clerks and Freight Handlers. The railroad contends that it has reached an amicable agreement with duly elected representatives of its employees in these various classes and that the national brotherhoods in no way represent the voice or desires of the Pennsylvania employees. In order that the position of the railroad with respect to the railway and steamship clerks and freight handlers' organization can be definitely placed on record, the Board summoned Samuel Rea, president of the Pennsylvania,

When he appeared, Mr. Rea made it clear that he was present merely to explain the railroad's position with respect to the case and not to negotiate with the Brotherhood of Railway and Steamship Clerks. He stated that to comply with the Board's decision in this case would mean the repudiation of legal and binding contracts with the Pennsylvania employees and the breaking down of close and friendly relations, which now prevail, to a greater degree than at any time since pre-war days.

INCREASES GRANTED BY CARRIERS TO MAINTENANCE OF WAY EMPLOYEES

Name of Carrier	Foremen of Mechanics	Assistant Foreman of Mechanics	Section Foreman and Assistants	Mechanics	Mechanics' Helpers	Track Laborers	Drawbridge Tenders, Piledriver, Pumpers, etc.	Date Effective
Atchison, Topeka & Santa Fe System	2½ cents.	2½ cents.	Minimum, $116.16; all above, $2.04; Assistants, 2½ cents	2 cents.	1 cent.	1 cent. Except the G. C. & S. F., ½ cent.	1 cent.	May 1, 1923.
Lehigh Valley						3 cents.		April 9, 1923.
Buffalo, Rochester & Pittsburgh	$9.80	Fence gang and Ditcher foremen, $9.80; ditching and derrick engineers, $10; pile driver engineer, minimum, 70 cents	Section and extra gang foremen, $9.80 mo.; assistant track foremen, minimum $112 mo.	4 cents.	Carpenter Helpers, 1 cent; mason helpers, 3½ cents	3 cents.	Pumpers, $5.12; P. D. firemen, $6.12; watchmen, $3.12	April 1, 1923.
St. Louis-San Francisco	1 cent.	1 cent.	1 cent to 3 cents.	1 cent.	½ cent.	Section laborers, 1 cent.	Pumpers and Crossing watchmen, 1 cent	March 1, 1923.
Chicago & Eastern Illinois	$4.08	$4.08; 2 cents.	Track foremen, $4.08	Minimum, 58 cents; 1 or more years' experience, 60 cents—Chicago, Ill., and St. Louis div. Minimum, 57 cents; 1 or more years' experience, 59 cents—Evansville div.	1 cent.	Minimum, 39 cents; maximum, 41 cents	Pile driver, Ditching and hoisting firemen, 2 cents; 3 pumpers, from $2.12 to $7.62	March 1, 1923.
Boston & Maine			3 cents.			3 cents.		April 20, 1923.
Long Island						3 cents.		March 16, 1923. May 1, 1923.
New York, New Haven & Hartford Central New England	Carpenters, bridgemen and painter foremen, 63 cents to $160; mason foremen, 65 cents to $165			4 cents.	2 cents.			April 20, 1923.
Philadelphia & Reading			#Sub-foremen, 1 cent	2 cents to 3 cents.	1 cent.	1 cent to 3 cents.	3 cents	#April 16, 1923.
Baltimore & Ohio	$10	Pile driver, ditching engineer, $10; hoisting engineer, 3 cents; coal chute and labor foremen, 3 cents	Section foremen, 1 cent	4 cents.	1 cent.	½ cent to 3½ cents; maximum 40 cents	Crossing watchmen and lampmen, $3; drawbridge tenders, pumpers, pile driver and ditching firemen, $5; *Hoisting Firemen, 3 cents	April 1, 1923. *May 16, 1923.
Rutland				3 cents.	1 cent.	Track laborers, 2½ cents		March 17, 1923.
Pere Marquette			Section foremen, $1.84 to $14.34; minimum, $112.50; maximum, $135			Track laborers, from 1 cent to 11 cents; minimum, 35 cents; maximum, 45 cents		April 1, 1923.
New York Central		Pile driver, ditching and hoisting engineer, $10.20; coal dock foremen, $6; fence foremen, $4.80	Section foremen, $2.80 to $12.80; assistant section foremen, 1 cent	¼ cent to 4 cents.	1 cent to 3 cents.	1 cent to 3½ cents.	$2.76 to $14.34	March 1, 1923.
Great Northern	$10	$10	Section foremen, Twin City Terminal, $8.84; outside, $5.84; assistant section foremen, 3 cents	3¼ cents.	2 cents.	Twin City Terminal, less than 1 year, 3 cents; 1 year or more, 4 cents; outside of Twin City Terminal, less than 1 year, 2 cents; 1 year or more, 3 cents	Pumping engineer and pumpers, ditching, hoisting and pile driver firemen, $6.12; drawbridge tenders and assistants, crossing watchmen or flagmen, lamplighters and tenders, 3 cents	May 15, 1923.
Bangor & Aroostook			2 cents.			2 cents.		May 8, 1923.
Central Railroad of New Jersey	2 cents.		Foremen, $5	2 cents to 4 cents.	3 cents.	3 cents.		May 1, 1923.
Cleveland, Cincinnati, Chicago & St. Louis			Foremen, maximum, $5.	4 cents.		3 cents.	Pile driver ditching and hoisting firemen, no increase; all others $3.	April 1, 1923.

NOTE—Figures given in cents denote rate or advance in rate per hour. Figures given in dollars denote rate or advance in rate per month.

Seaboard Air Line						Minimum 22 cents; maximum, 25 cents	Crossing watchmen, bridgetenders' assistants and pumpers, 2½ cents to 3 cents	March 1, 1923.
Gulf, Mobile & Northern						*Extra gang, 2 cents; †yard section, 2cents; ‡line section, 2½ cents.		*April 1, 1923. †April 16, 1923.
Richmond, Fredericksburg & Potomac								April 16, 1923.
Georgia Railroad	$9.70	$12.80	Section foremen, $6.22 to $13.72; apprentice section foremen, 2 cents				Pumpers, $1.94 to $19.06 mo.	May 16, 1923.
Norfolk Southern	2 cents. $5.84		Section foremen, 2 cents; ‡extra gang foremen, 2 cents; section foremen, $6.76	1 cent.				January 1, 1923. April 1, 1923.
Central of Georgia	$5	$5	$5	2 cents.		Track labor, 18 cents; bridge and building labor, 25 cents		(Date not shown.)
Florida East Coast	$5 to $11.80	$5 to $10	Section foremen, $10.92					November 16, 1922.
Pittsburgh & Lake Erie Lake Erie & Eastern		P. D. ditch and hoist engineer coal chute foremen, 5 cents; fence gang foremen, $5	Section track and track foreman, $5; assistant foremen, 1 cent		1 cent.	3 cents.	Pumpers, $5.12; ditcher and rotary firemen and lampmen, 3 cents; watchmen, $3.	March 1, 1923.
Gulf Coast Lines Houston Belt & Terminal	$5.00		Section and extra gang foremen, $1.84 to $4.84	Carpenter and painter, 2 cents	Carpenter and painter helper, 1 cent	1 cent.	Lamp tenders, $1.12 to $1.52; pumpers, $1.12	May 1, 1923.
Chicago, Burlington & Quincy	$4.80; minimum, $165		$2.04; minimum, $114	3 cents.	1 cent.	1 cent.		
Maine Central						2 cents to 3 cents.		

NOTE—Figures given in cents denote rate or advance in rate per hour. Figures given in dollars denote rate or advance in rate per month.

Measures for Malaria Control

IN A treatise prepared for engineering students and published by the St. Louis Southwestern, a number of suggestions are made for the control of malaria which come within the province of maintenance of way officers responsible for the conduct of work within that department and which are of interest particularly to those roads where malaria is prevalent. Among the recommendations are the following:

In areas where malaria prevails, don't fail to consider standing or sluggish water as a menace to health and its removal or control probably of great importance.

Consider undrained borrow pits as a potential danger that should not be allowed.

Whenever possible, culverts must be so placed as to drain the bottom of all wet lands in the culvert's drainage valley, and not interfere with future small drainage projects on farm lands, etc.

Do not attempt to drain seepage outcrops with "crowfoot" ditches when intercepting ditches are necessary. In making intercepting ditches, the excavated material should, of course, be placed on the down hill side of the ditch.

Do not allow contractors or others to dig wide bottom ditches along highways and railroads where narrow bottom ditches can be used, and see that those ditches are dug to proper grade so as to retain a minimum of stagnant water.

Do not fail to use your influence for the proper maintenance of roadway and railroad ditches, particularly near settlements, villages and towns.

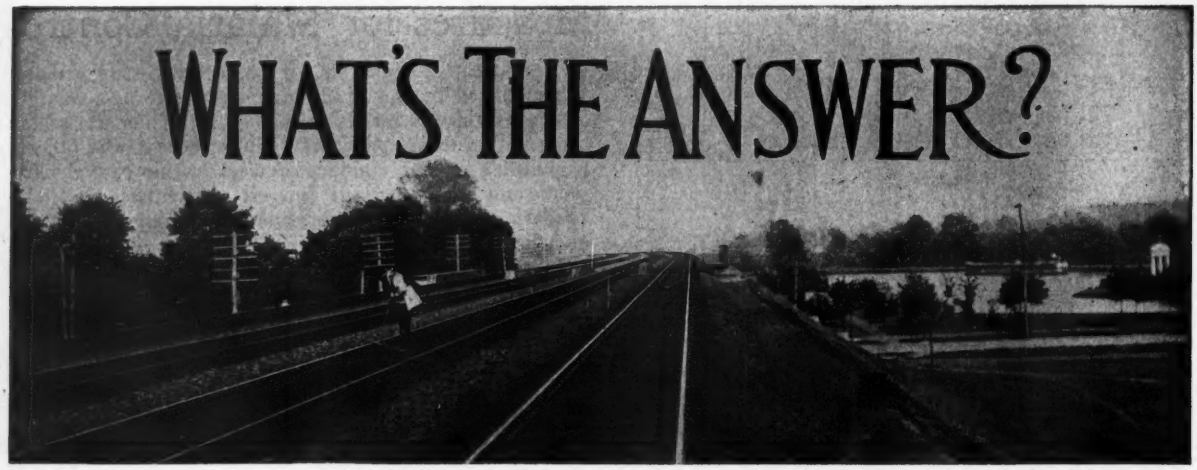
In establishing labor camps, when possible locate the camp where Anopheles breeding places within flight range are fewest. Examine all territory within a mile radius of any proposed camp site being considered. Consult with the local medical profession in reference to the presence of malaria, and also the state health department. If the native people want the camp location accepted, they may forget all about the past history of malaria. Inquire at the nearest drug store or grocery store relative to the local sale of chill tonic and be careful how you word your questions. It is advisable to get the information without making your reason for wanting it known.

An engineer who selects the location for a camp is to a certain extent responsible for the future health status or death and sick rate, and should not skirt that responsibility. He can determine in advance whether or not he is going to have a malaria problem to deal with. If so, he should determine how serious it may be and then take necessary precautions accordingly. A common error is the assumption that a hill top is healthy. This false assumption originated with the idea that malaria was due to fogs or miasmas in the valleys.

Most malaria is transmitted after dark. If the camp is located close to a village or town containing many chronic cases of malaria (walking cases), the men from camp who visit that place after dark will contract malaria if Anopheles are present.

In establishing camps (if the camp is to remain in one locality much longer than a week) it is advisable to know that you have no malaria carriers among your men who will infect the Anopheles in the vicinity. Such cases should take quinine treatment.

Men who visit families or settlements adjacent to the camps after dark can often be protected by taking prophylactic doses of quinine. Among new arrivals or visitors at the camp may be several cases of malaria.



This department is an open forum for the discussion of practical problems of engineering and maintenance of way. Readers are invited to send in any questions which arise in their work in the maintenance of tracks, bridges, buildings and water service. *Railway Engineering and Maintenance* also invites the co-operation of its readers in answering any of the questions listed below.

Answers to the following questions will be published in the August issue:

(1) What is the best method of cleaning stucco surfaces?
(2) What is the best way to adjust the throw of a switch stand?
(3) Under what conditions is it advisable to apply cement wash to concrete surfaces? How should it be prepared and applied?
(4) How much time should be allowed for settlement in designing or operating reservoirs used for clarifying muddy water as well as for storage?
(5) What is the most practical finish for hardwood floors in railway offices?
(6) What are the advantages of oiling angle bars in track? How can this be done most economically by section forces?
(7) What is the most practical and economical method of renewing stringers in wooden bridges?
(8) What is the purpose of injecting water into internal combustion engine cylinders, and is the practice to be recommended?

The Proper Slope for Ditches

What is the practical slope for roadway ditches?

First Answer

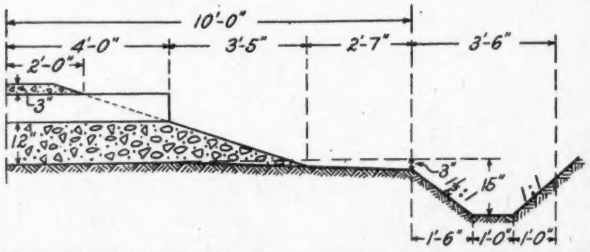
The practical slope for the bottom of roadway ditches is governed entirely by the grade of the track. If the track is level it is impossible to give much fall to the bottom of the ditch. It is not advisable to dig an open ditch to a greater depth than 2½ ft. below the bottom of the ties. In many cases it is impossible even to maintain an open ditch at that depth, for if the surface is wet the sides will slide in and clog up the ditch after it is cleaned out. There are cases where cuts will drain in each direction, and wherever there is sufficient opportunity for drainage it should be the aim to give as much fall as the conditions will permit. This cannot be set by any standard.

J. O'CONNOR,
General Roadmaster, Minneapolis, St. Paul & Sault Ste. Marie, Minneapolis, Minn.

Second Answer

It is a difficult matter to build surface ditches paralleling the track to any slope other than the general grade of the track throughout the cut. It is proper to build them at a uniform depth below the top of rail. There is scarcely any grade on the track that will cause the ditch to scour out on account of the velocity of the water, except at the outlet where the water has a considerable fall and will scour or cut out the embankment adjacent to the cut, sometimes to such a depth as to undermine the sub-grade. Where the grade of the track is so slight as to cause a low velocity of water, it is necessary to confine the water to as small a body as possible to increase the velocity enough to cause it to flow off and prevent it from soaking into the sub-grade.

The accompanying illustration of the standard roadbed cross-section of the Illinois Central shows the most effective method I know of accomplishing this result



The Illinois Central Standard Cross-Section for Drainage

as well as to get proper drainage of the roadbed. Before the ballast is applied the sub-grade is crowned, sloping to a point 10 ft. from the center line of track.

At this point it slopes outward 1½ ft. to 1 ft. with a 12 in. bottom and a slope extending up in the cut 1 ft. to the foot or 1½ ft. to the foot, depending on the soil. This leaves a V-shaped ditch at the outer edge of the cut which confines the water to a small body, allowing it to flow freely. A large body of water will flow in most any kind of a ditch, but, where the volume of water is small and the bottom of the ditch wide and flat, the water will spread and soak into the ground, softening the roadbed.

In other cases the grade of the track may be such as to cause a swift current. There is no grade on the track so great, however, as to cause a wash in the ditch until the water reaches the end of the cut. At this point an opening should be put in much wider than the ditch itself, rounding the bottom. Rough stones or boulders should be laid in the opening and on the embankment to deflect the water from the embankment. This construction is often termed a "slushway." There are always small boulders in the ordinary bank run gravel which are suitable for this purpose, also such boulders that are too large to be used as ballast.

Another important feature about surface ditches in cuts is to see that the ditch has a uniform surface on the bottom so that small quantities of water will not lodge and soak into the ground. This is particularly true in the spring and fall when evaporation is slow, and more water soaks into the ground. E. J. BOLAND,

Roadmaster, Illinois Central, Freeport, Ill.

Flanged Pipe for Pump Suctions

Under what conditions, if ever, should flanged end cast iron pipe be used for pump suctions from creeks or rivers?

First Answer

Where it is decided to use cast iron pipe in preference to wrought iron pipe, either because of the size of the line, its length, or the greater protection afforded from corrosion, and where the ground in which the pipe is to be laid is soggy, it is sometimes better to use the flanged type of cast iron pipe on account of its greater structural rigidity. A settlement at any point in the line will open lead in the bell and spigot pipe much easier than it will the joints of flanged pipe. Under such conditions the pipe should be connected by using wrought iron bolts. Ordinarily flanged pipe is easier to lay in soggy grounds than bell and spigot pipe. When it is considered that flanged cast iron pipe 250 years old is still in service, it is obvious that no objection can be raised to this pipe from the standpoint of durability. As a matter of fact, there seems to be no great reason other than custom, why flanged pipe is not used more than it is at the present time. P. M. LABACH,

Engineer Water Service, Chicago, Rock Island & Pacific, Chicago.

Second Answer

The use of flanged end cast iron pipe for suction intake lines may be advisable where the pipe is laid in a trench from which it is impracticable to exclude the water for a sufficiently long period to allow running the lead joints for standard cast iron bell and spigot pipe. However, it would seem that except in some unusual case where corrosion conditions may be bad, standard wrought iron or steel pipe, either screwed together or put together with flanges, will answer every purpose and be less likely to cause trouble due to breakage. EDWIN M. GRIME,

Supervisor Bridge & Buildings, Northern Pacific, Fargo, N. D.

Sawing Piles Under Water

How may piles be sawed off under water without requiring the services of a diver?

This may be accomplished conveniently by means of a circular saw attached to the bottom of a vertical shaft. The shaft is set in a frame work with bearings for taking care of the end and side thrust and is operated by a small gasoline engine or other power which may be available. In other words a common circular saw is set to work in a horizontal instead of vertical position and is shifted around to the different piles as required by means of a derrick, pile driver leads or other facility which may be available. E. M. G.

Wood and Steel for Tank Towers

What are the relative merits of wood and steel for water tank towers of ordinary height?

First Answer

I emphatically think that the answer is, steel. I am a little puzzled to know how any question could be raised as to these materials for this purpose in this part of the country. I think it has been 25 years since a water tank support built of wood was on this railroad, so that naturally we have considered the question of the relative merits of wood and steel for that purpose, settled.

O. E. SELBY,

Principal Assistant Engineer, Cleveland, Cincinnati, Chicago, St. Louis, Cincinnati, O.

Second Answer

Whether wood or steel would be used for water tank towers is principally dependent upon which has the lowest annual cost. When a steel tank is erected the substructure, for obvious reasons, should also be of steel but either a steel or a wood substructure will answer equally well for supporting the 50,000 or 100,000 gal. wood tanks in common use.

It may be assumed for this purpose that the life of untreated timber is 12 years, the life of treated timber 22 years and that of steel 40 years. Taking into consideration interest charges, depreciation, maintenance and insurance it is found on this basis that the substructure built of treated timber (full impregnation) is the most economical. E. M. G.

Third Answer

It is my experience that the wooden tub water tank is getting to be a thing of the past, but where they are still maintained there is no question about the ecenomy of a steel tower. The Rock Island has steel towers under wooden tubs on the line between Kansas City and St. Louis, which was built about 1904. When renewing some of these tubs the steel towers were found in good condition. Recently when tearing down a 30-ft. by 20-ft. wooden tub with a steel tower built in 1883, the tub was found to be completely rotted while the tower was still serviceable, although not of a good design.

The weakest points in a tank are, ordinarily, the floor beams and the caps of the tower. These rot readily and are generally the limiting factors in the age of the structure. Therefore with a steel tower with steel floor beams this element of destruction is eliminated. As a rule a steel tower should be built even though the tub is to be of wood. The real reason why wooden towers have been retained for so many years is probably to be found in the fact that the master carpenter, when erecting the tub,

could erect a tower with material that he could get from the store department, while the steel tower was obtainable only from outside sources. C. A. MORSE,
Chief Engineer, Chicago, Rock Island & Pacific, Chicago.

Clearing Snow with Explosives

To what extent have explosives been found useful in clearing railway lines of heavy snow drifts?

First Answer

The only instance recalled of explosives having been used in clearing railway lines of heavy snow was on the Northern Pacific about a year ago, when a snow slide from one of the mountains deposited an immense quantity of wet snow on the tracks, where it froze. The rotary snow plow was not able to make any impression on it and recourse was had to a large quantity of black blasting powder. This powder was loaded into holes punched nearly horizontal in the snow, about one foot above the tracks and ten feet deep, several such holes being placed parallel with each other and fired electrically. It was found that no damage was done the track, but the snow was completely removed.

Dynamite has been used for clearing the roads of snow in Mount Rainier and Yellowstone national parks. Where the black blasting powder can be used, it will probably be much superior to dynamite.

ARTHUR LA MOTTE,
Manager Technical Section, E. I. duPont de Nemours Company, Wilmington, Del.

Reinforcing Concrete Piers

What is the function of reinforcement in a concrete pier for slab bridges?

Mass concrete piers, having the general proportions of stone masonry piers, need no reinforcement because no reasonable combination of circumstances as to loading or settlement could result in any tension stresses in the body of the pier. As a rule, reinforcement is provided in such piers only when they are of large proportions, such as the piers of large or important bridges. Here surface reinforcement is sometimes provided to insure against temperature cracks.

With a reduction in the thickness of the pier, say to 30 in. or less, the pier may be said to assume more the characteristics of the bent, and while analysis may show compression over the entire section under any reasonable assumption as to loads, conservative practice leans toward the provision of a small amount of reinforcement in the form of vertical bars next to each face, extending from the top well into the footing, whereby the pier or wall may act as a vertical cantilever beam in much the same way as would actually be found to be the case in a narrow pier of considerable height. Where such vertical reinforcement is provided, a few horizontal bars are also usually inserted to hold the vertical bars together.

Experience with narrow piers supporting concrete slabs has demonstrated the need of protection against a splitting action tending to divide the pier along its longitudinal axis. As the expansion bearings of concrete slabs are far from perfect, there is a tendency during periods of falling temperature for the slabs to pull the pier apart or start a crack directly under the joint between the ends of the two slabs. Resistance to this action could be provided by inserting a series of bars, spanning across the top of the pier and bent down next to the two side faces of the pier or hooked over the top longitudinal bar in each face.

Estimating Building Costs

When estimating the cost of constructing various railway buildings is it a safe practice to figure the cost of erection as a certain percentage of the entire cost of material and if not, what is the preferred method?

First Answer

The way the costs of both material and labor have fluctuated during the past six years makes it rather difficult to select a preferred method for estimating, which may be called safe practice. It is certainly impracticable at this time to establish any very definite relation between the costs of labor and material.

As far as labor is concerned the safe way is to keep unit costs on the various classes of work performed, such as excavation, concrete, brick, lumber, millwork, heating, plumbing, plastering, roofing, painting, etc., so as to know the unit cost of labor of average efficiency for your particular conditions. This may be kept up to date by altering it to correspond with the fluctuations in wages, not overlooking the fact that as wages increase efficiency decreases. EDWIN M. GRIME.

Second Answer

The question is taken to refer to the various items of work entering into different railway buildings, such as cubic yards of excavation, concrete, thousand brick, etc. Such an interpretation is given the question by reason of the influence of varying conditions upon the percentage of labor cost entering into a complete railway building unit. Of course, if the cost information is to be derived for approximate use, the percentage method for labor would probably serve the purpose. However, if such cost information is wanted for use in compiling a bid or proposal for a building project, the practice of using a percentage of the total cost of material is not reliable. This is true for a number of reasons, chief among which are the varying efficiency of labor and wages in different parts of the country.

The most correct method possible of arriving at the labor cost for a given piece of work is to estimate the hours of labor required to do the work. This method naturally requires wide experience, and not only this but an accurate system of cost finding on the jobs that are being constructed. With such a combination of methods the estimator can watch his job costs on labor and use such information in figuring future jobs in so far as such projects have similar labor features, according to his judgment. P. AAGAARD,
General Building Inspector, Illinois Central, Chicago

Third Answer

Until several years ago, the Chicago & Eastern Illinois used the labor cost on buildings as a certain percentage of the entire materials but it proved very unsatisfactory for various reasons. During and after the war, the method was nothing more than a guess and sometimes a very poor one at that. I would not in any case recommend figuring the labor cost on a structure as a percentage of the cost of materials.

The "man hour" method of estimating labor costs is fairly accurate. With it one is in a position to figure the cost of labor in almost any section of the country with some confidence. It is especially valuable to the railroad that does not maintain large building gangs and which contracts a large percentage of its work. For example, suppose on a small station building, built with company forces, the carpenters are paid a rate of approximately 61 cents per hour. If this particular build-

ing had been awarded to a contractor his rate of pay for carpenters would have been $1.10 per hour or more, depending on the scale paid in that particular territory. The difference in the rates of pay in this one trade is approximately 50 cents per hour more for the contracted job on the same building or an increase of approximately 80 per cent in labor cost. Since this is true of most of the building trades, it is not safe practice to figure the cost of erection as a certain percentage of the material cost. Another item which makes the percentage method impracticable is the variation in the price of labor and material in different sections of the country.

For quick approximate estimating on building costs, the cubical content method is satisfactory, the method being kept up to date by checking the building reports for the various types of structures, both for contract and company force work.

F. A. ESKRIDGE,
Assistant Engineer, Chicago & Eastern Illinois, Chicago

Cost of Digging Pipe Line Trenches

In about what proportions does the cost of digging pipe line trenches increase with the depth under average conditions in earth, sand, gumbo and rock respectively?

The accompanying tables, reprinted from the 1922 edition of Gillette's Handbook of Construction Costs, page 181, while not furnishing a complete answer to the question are of value in giving the amount of excavation of various materials which may be expected of an average laborer working with a pick and shovel for ten hours under good supervision. Table 1, shows the number of cubic yards an average laborer should excavate and cast out of trenches at various depths in ten hours, while working at the depth stated. Table 2, shows the average number of cubic yards per ten-hour day, that an average laborer should excavate, working from the surface to the depth stated. These figures are based on conditions prior to 1914 when the efficiency of labor was about 50 per cent greater than the efficiency of average labor at present.

TABLE 1—Cubic Yards Per Man Per 10 Hours at Stated Depths.

	0 ft. to 3 ft.	3 ft. to 5 ft.	5 ft. to 8 ft.	8 ft. to 10 ft.	10 ft. to 15 ft.
Sand	21.2	14.5	10.7	8.5	5.2
Gravel, loose	15.4	11.8	9.2	7.7	4.9
Earth	12.8	10.5	9.0	7.5	4.9
Light clay	8.9	7.3	6.0	5.2	3.8
Dry clay	6.4	5.3	4.7	4.1	3.2
Wet clay	5.4	4.7	4.2	3.5	2.7
Hard pan	4.6	4.2	3.7	3.3	2.7

As will be noted, the above figures refer only to the actual yardage to be removed at various depths, which must be adapted to the particular width of trench dug in order to afford a basis for determining proportionate costs of digging at various depths. The width of any trench, of course, will depend both upon the size of pipe to be laid, the depth of digging and the nature of the material excavated. Under ordinary conditions and with a material that does not require sheeting, it may be said that up to depths of 5 or 6 ft. the widths of trench should be at least 1½ ft. and 2 ft. for 4 in. and 12 in. pipe respectively, the usual width of trench for 6-in. pipe being 2 ft. Working on this basis the cost of digging a 6 ft. trench for 12 in. pipe, should be estimated to be at least 35 per cent greater than the same depth of ditch for 4 or 6 in. pipe.

TABLE 2—Average Excavation in Cubic Yards Per 10 Hours for Cuts From Surface to Stated Depths.

	0 ft. to 3 ft.	0 ft. to 5 ft.	0 ft. to 8 ft.	0 ft. to 10 ft.	0 ft. to 15 ft.
Sand	21.2	18.1	15.1	13.6	10.7
Gravel, loose	15.4	13.7	11.8	10.8	8 8
Earth	12.8	11.7	10.5	9.7	8.1
Light clay	8.9	8.1	7.3	6.7	5.8
Dry clay	6.4	5.9	5.4	5.1	4.5
Wet clay	5.4	5.1	4.7	4.4	3.8
Hard pan	4.6	4.4	4.2	3.9	3.5

A good illustration of the variation in the cost of digging trenches of the same depth but of variable widths, is furnished by the experience of the City of Chicago laying cast iron water pipe for a period of ten years prior to 1911. In this case, the excavating and refilling of 6 ft. trenches was, as compiled from careful records of contract work, found to be 9.5 cents per lineal foot for 4 in. pipe, 12 cents for 6 in. pipe, 13 cents for 8 in. pipe, 16 cents for 10 in. pipe and 20 cents for 12 in. pipe. Thus the trenching for the 6 in. pipe cost 1.26 times more than for the 4 in. pipe trench, the 8 in. pipe 1.37 times more than the 4 in. pipe trench, the 10 in. pipe 1.7 times more than the 4 in. trench and the 12 in. pipe, 2.1 times more.

In the absence of actual figures on work done in the locality in question, it may be taken as a reasonably safe rule, therefore, that up to 6 ft. in depth the cost of digging in different materials for the same size of pipe will vary with a yardage that can be handled at that depth as indicated by the tables (modified to suit prevailing rates of efficiency of labor), while the cost for different sizes of pipe at a determined depth will vary according to the figures just given. For further data on this subject, the reader is referred to Gillette's Handbook.

Two New Positions on the C. & O.

THE CHESAPEAKE & Ohio has recently created two new positions in the maintenance of way department with system jurisdiction and covering the important problems of painting and the general improvement of appearance of railway property. The creation of the first position resulted from the unusually heavy painting program which the railway faces.

The supervisor of painting for the system will have general supervision over all painting forces. He will see that the standard uniform colors are furnished and applied; that standard practices in the application of paint are inaugurated; that structures are properly prepared before painting and that forces are organized and maintained with the greatest economy and best results. He will prepare, at the beginning of each year a program for the season's painting, furnishing estimates of the labor and material required for the execution of this program and will see that the program is carried out. He will also make practical tests for the application of paint by the spray method and determine where it is advisable to use the spray method in painting. He will keep complete files and records of the service obtained from paints of various manufacture. He must be a practical painter of long experience and thoroughly familiar with all requirements. It is expected that the economies obtained will fully justify the appointment.

The position of supervisor of station grounds requires an experienced and practical florist and gardener who will, in conjunction with station agents and with the assistance of section and station forces, plan, arrange and plant flowers and shrubbery and supervise the care of lawns at the principal stations, with the idea of effecting a general improvement in the appearance of the property. He will also supervise the work of bank protection by the use of vines, and will have general direction of the beautification of station grounds.

The Production of Rail Decreases

THE ANNUAL production of rail in the United States continues to decline according to statistics issued by the American Iron and Steel Institute, New York. The total production of 2,171,776 tons in 1922 is 7,042 tons less than the production in 1921, and is the lowest in the seven years since 1914. It is less by nearly a half million tons than the production of 1920, which was the highest since the outbreak of the war, and except for 1914, is the lowest production since 1898. Last year showed a continuation of the marked decrease in the production of Bessemer rail, only 22,317 tons being rolled, as compared with 55,559 tons in 1921. The rapid and practically continuous decline in the production of Bessemer rails since 1908 shows that this material is fast becoming obsolete. In contrast to the Bessemer rail, the records show an increase of 20,420 tons, or about 20 per cent in the production of rerolled rails, over the production for 1921. This figure, however, is still below that of 1920, which was 126,698 tons. An increase also occurred in the production of open-hearth rail, amounting, however, only to 6,215 tons, or slightly more than 0.3 per cent.

PRODUCTION OF RAILS BY PROCESSES, GROSS TONS.

Years	Open-hearth	Bessemer	Rerolled*	Electric	Iron	Total
1908.....	571,791	1,349,153	.....	.....	71	1,921,015
1909.....	1,256,674	1,767,171	.....	†	.....	3,023,845
1910.....	1,751,359	1,884,442	.....	†	230	3,636,031
1911.....	1,676,923	1,053,420	91,751	462	234	2,822,790
1912.....	2,105,144	1,099,926	119,390	3,455	234	3,327,915
1913.....	2,527,710	817,591	155,043	2,436	.....	3,502,780
1914.....	1,525,851	323,897	95,169	178	.....	1,945,095
1915.....	1,775,168	326,952	102,083	.....	.....	2,204,203
1916.....	2,269,600	440,092	144,826	.....	.....	2,854,518
1917.....	2,292,197	533,325	118,639	.....	.....	2,944,161
1918.....	1,945,443	494,193	101,256	.....	.....	2,540,892
1919.....	1,893,250	214,121	96,422	50	.....	2,203,843
1920.....	2,334,222	142,899	126,698	297	.....	2,604,116
1921.....	2,027,215	55,559	96,039	5	.....	2,178,818
1922.....	2,033,000	22,317	116,459	.....	.....	2,171,776

*Rerolled from old steel rails. Included with Bessemer and open-hearth steel rails from 1908 to 1910, inclusive. †Small tonnages rolled in 1909 and 1910, but included with Bessemer and open-hearth rails for these years.

The records of total production include the girder and high T rails for electric and street railways, the tonnage of which for recent years was as follows: 1917, 91,674; 1918, 20,834; 1919, 112,712; 1920, 100,910; 1922, 89,162; 1922, 128,878 gross tons. Deducting these figures from the total gives a more representative record of the production of rail for steam roads. Such a computation places the production for 1922 at 2,300,654 tons as compared with 2,267,870 tons for 1921, or an increase of about 1.1 per cent. It will be noted, however, that these figures still include the production or the import and export production.

PRODUCTION OF RAILS BY PROCESSES, GROSS TONS.

Kinds	1921	Per cent	1922	Per cent	Increase	Per cent
Open-hearth..	2,027,215	93.04	2,033,000	93.61	5,785	.29
Bessemer....	55,559	2.55	22,317	1.03	*33,242	59.83
All other.....	96,044	4.41	116,459	5.36	20,415	21.26
Total.....	2,178,818	100.00	2,171,776	100.00	*7,042	*.32

*Decrease.

The total production of rail as given above, includes in addition to the new rails rolled, rails rerolled from defective rails and from old rails. The total of renewed or rerolled rails, included is given below in gross tons. This record shows that practically all rerolled rails were produced from old rails, rather than from the rerolling of new seconds and defective rails, the latter amounting only to 996 tons in 1922, as compared with 7,227 tons for 1921, and this amount having been obtained entirely from open-hearth steel.

PRODUCTION OF RENEWED AND REROLLED RAILS.

Years	Rerolled from new seconds, new defective rails, etc.			Rolled from old rails	Total rerolled
	Open-hearth	Bessemer	Total		
1914.....	13,538	13,234	26,772	95,169	121,941
1915.....	6,477	2,652	9,129	102,083	111,212
1916.....	1,711	2,149	3,860	144,826	148,686
1917.....	1,825	7,182	9,007	118,639	127,646
1918.....	13,296	19,462	32,758	101,256	134,014
1919.....	1,933	5,766	7,699	96,422	104,121
1920.....	19,493	1,979	21,472	126,698	148,170
1921.....	6,525	702	7,227	96,039	103,266
1922.....	996	.....	996	116,459	117,455

Records of the production of different weights of rail show a continued increase in the production of rail of 100 lb. section and heavier. As the table shows the production of the heavier sections has continued to increase since 1914, and in 1922 for the first time exceeded the production of rails weighing between 85 and 100 lb. In contradistinction with the production of rail of 100 lb and over, the production of rails of 85 lb. and less than 100 lb. sections has continued to decline since 1916, being 728,604 tons in 1922, as compared with 902,748 tons in 1921, or a decrease of nearly 20 per cent. The production of rail of less than 85 lb. section has continued about the same.

PRODUCTION OF RAILS BY WEIGHT PER YARD

Years	Under 45 pounds	45 and less than 85	85 and less than 100	100 pounds and over	Total Gross tons
1906.....	284,612	1,749,650	1,943,625		3,977,887
1907.....	295,838	1,569,985	1,767,831		3,633,654
1908.....	183,869	687,632	1,049,514		1,921,015
1909.....	255,726	1,024,856	1,743,263		3,023,845
1910.....	260,709	1,275,339	2,099,983		3,636,031
1911.....	218,758	1,067,696	1,536,336		2,822,790
1912.....	248,672	1,118,592	1,960,651		3,327,915
1913.....	*270,405	†967,313	2,265,062		3,502,780
1914.....	*238,423	†309,865	868,104	528,703	1,945,095
1915.....	*254,101	†518,291	742,816	688,995	2,204,203
1916.....	*295,535	†566,791	1,225,341	766,851	2,854,518
1917.....	*308,258	†882,673	989,704	763,526	2,944,161
1918.....	*395,124	†665,165	888,141	592,462	2,540,892
1919.....	*263,803	†495,577	965,571	478,892	2,203,843
1920.....	*489,043	†433,333	952,622	729,118	2,604,116
1921.....	*211,568	†214,936	902,748	849,566	2,178,818
1922.....	*265,541	†274,731	728,604	902,900	2,171,776

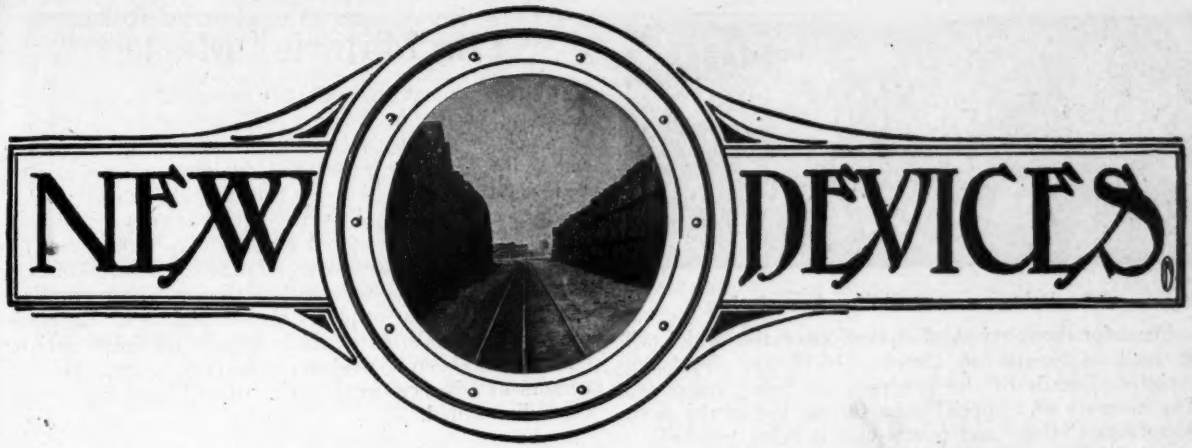
*Includes rails under 50 pounds. †Includes 50 pounds and less than 85 pounds.

There has been a notable decrease in the production of alloy-treated steel rails, as shown by the following table, the production in 1922 being only 3,163 tons, of which 2,007 tons was rail of 100 lb. and over. The records also show that the predominant alloy was Titanium, the tonnage in 1922 amounting to 2,493 tons as compared with 670 tons for all other alloys.

PRODUCTION OF ALLOY-TREATED STEEL RAILS, 1912-1922

Years	Total production Gross tons	Production by alloys		Production by processes		Production by weight per yard			
		Titanium	Other alloys	Open-hearth and elect.	Bessemer	Under 45 lbs.	45 and under 85 lbs.	85 and under 100 lbs.	100 lbs. and over
1912..	149,267	141,773	7,494	40,393	108,874	21	5,426	143,820	
1913..	59,519	47,655	11,864	33,567	25,952	*01	†9,414	50,014	
1914..	27,937	23,321	4,616	27,447	490	*14	†1,168	8,301	18,454
1915..	24,970	21,191	3,779	24,367	603	*6	†1,977	6,555	16,432
1916..	28,562	26,493	2,069	27,675	887	.....	†1,761	10,506	16,295
1917..	16,535	15,273	1,262	16,535	.....	.....	†335	6,671	9,529
1918..	3,111	2,891	220	3,111	.....	.....	†47	2,640	424
1919..	6,476	6,207	269	6,476	.....	.....	.....	3,920	2,556
1920..	12,909	11,652	1,257	12,909	.....	.....	†514	5,069	7,326
1921..	6,276	2,804	3,472	6,276	.....	.....	†71	4,277	1,928
1922..	3,163	2,493	670	3,163	.....	.....	†321	835	2,007

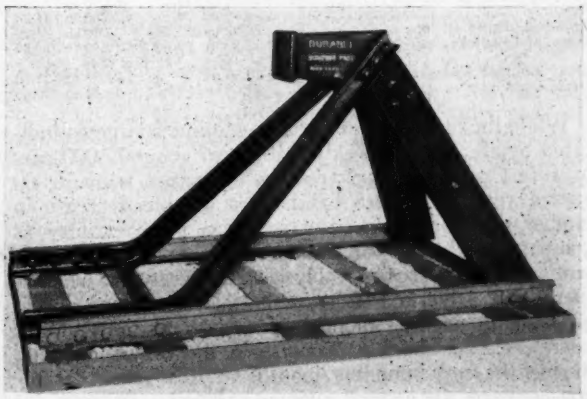
*Includes rails under 50 pounds. †Includes 50 pounds and less than 85 pounds.



A New Passenger Bumping Post

THE Mechanical Manufacturing Company, Chicago, has recently introduced a new bumping post for passenger car tracks, known as the Durable All-Metal Passenger Bumping Post, which has been developed substantially along the lines of the Durable All-Metal Freight Post, which has been in general use on the railroads for some time. The new passenger post, like the freight post, has been designed especially with a view to combining maximum strength and rigidity with the shortest possible track space.

As shown in the illustration, it consists of a cast bumping head supported by four legs, two of which are made from steel rails and the other two from structural steel



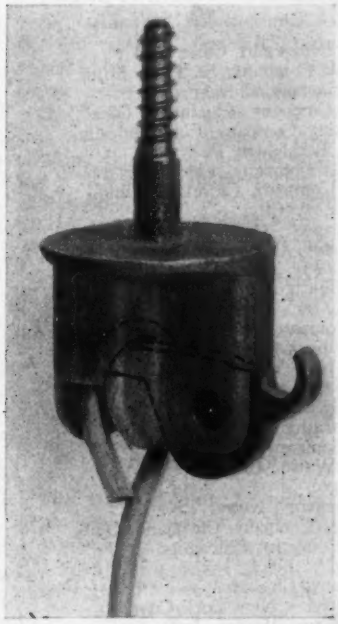
The All-Metal Bumping Post as Designed for Passenger Track Service

channels, all securely attached to the track rails. The two rails which form an important feature of this post are of a special quality of soft steel, rolled to specifications of the manufacturer to insure greater resistance to shock than could be obtained with standard track rails having a much higher carbon content. The channels are of 12-in., 35-lb. section, connected to the bumping casting head and to the track rails by extra heavy bolts, special beveled washers being provided at the rail connection. The connections at both the top and bottom of these channels are such as to give direct bearing on the ends of the channels with a tight fit which practically eliminates shear on the bolt.

The design of the post is such that the force of the blow struck by a car when coming in contact with the bumper casting is transmitted directly downward through the channels into the base of the running rail. The distance from the bumping casting head to the back of the channels is only 4 ft., 10¾ in. Another important feature to which the manufacturer has called attention is the simplicity of installation, all parts being above the ground. For the same reason the post can be taken apart quickly for re-assembling at another place.

Labor Saving Type of Bridge Tell-Tale

ONE OF THE items of maintenance which is often expensive as well as inconvenient to carry out is the renewal of bridge or tunnel warnings. Usually repairs are made by two men with the aid of a ladder. To overcome this difficulty, a new type of bridge warning has been developed by the Hastings Signal and Equipment Company, Boston, Mass., and is of distinct interest since it requires only one man to replace the tell-tales and these replacements can be made easily and quickly from the ground. Each tell-tale consists of a short piece of bronze wire looped at each end and a "tickler" of asbestos rope spliced on one end of the bronze wire. The hanger consists of a small bronze casting fastened permanently to an overhead structure, by screw or otherwise, and having self-contained within it an unbalanced lever which automatically closes across an opening into which the bronze wire goes. Tell-tales are inserted by the use of a light pole arranged to guide the loop into the slot where it is automatically caught. When it is desired to take one of them down, a pull on a hooked extension of the unbalanced arm causes the loop to be released and the tell-tale falls to the ground, after which a new one can then be inserted in the manner described. Since the wires are of bronze and the tickler ropes of asbestos there is a maximum of protection against rust and corrosion as well as from any destruction by fire.



The Tell-Tale With Wires in Position

The Bridge and Building Association

Plans for the thirty-third annual convention which will be held in Seattle on October 16-18 are developing rapidly. Details of the program are being completed. The itinerary of a special train for the use of the members from Chicago and points east is being planned.

The Roadmasters' Association

Recent advice from the chairmen of the various committees indicates that their reports are further advanced than usual and that they will be completed in ample time for review by the Executive Committee at its midsummer meeting, which will be held in June or July.

The Track Supply Association has sent a letter to its members and other manufacturers of maintenance of way equipment and materials announcing its plans for its exhibit and has already received requests from 44 firms for a large part of the space available. As the space remaining is being assigned in the order of the receipt of applications, early action is necessary to insure accommodations. The firms which have requested space prior to May 25, are as follows:

American Chain Company, Bridgeport, Conn.
American Hoist & Derrick Company, St. Paul, Minn.
American Steel & Wire Company, Chicago.
American Valve & Meter Company, Cincinnati, Ohio.
Balkwill Manganese Crossing Company, Cleveland, Ohio.
Bethlehem Steel Company, Bethlehem, Pa.
Chicago Malleable Castings Company, Chicago.
Cleveland Frog & Switch Company, Cleveland, Ohio.
Craft Incorporated, New York City.
Crerar, Adams & Co., Chicago.
Duff Manufacturing Company, Pittsburgh, Pa.
Elliot Frog & Switch Company, East St. Louis, Mo.
Fairbanks, Morse & Co., Chicago.
Fairmont Railway Motors, Inc., Fairmont, Minn.
Hayes Track Appliance Company, Richmond, Ind.
Headley Good Roads Company, Philadelphia, Pa.
Ingersoll-Rand Company, New York City.
Jordan Company, O. F., East Chicago, Ind.
Kalamazoo Railway Supply Company, Kalamazoo, Mich.
Lundie Engineering Corporation, New York City.
Maintenance Equipment Company, Chicago.
Morden Frog & Crossing Works, Chicago.
Mudge & Company, Chicago.
National Lock Washer Company, Newark, N. J.
National Malleable Castings Company, Cleveland, Ohio.
Oxweld Railroad Service Company, Chicago.
P. & M. Company, Chicago.
Pettibone, Mulliken Company, Chicago.
Pocket List of Railroad Officias, New York City
Positive Rail Anchor Company, Marion, Ind.
Rail Joint Company, New York City.
Railroad Supply Company, Chicago.
Railway Engineering & Maintenance—Railway Age, New York City.
Railway Review, Chicago.
Ramapo-Ajax Corporation, Hillburn, N. Y.
Reade Manufacturing Company, Jersey City, N. J.
Reliance Manufacturing Company, Massillon, Ohio.
St. Louis Frog & Switch Company, St. Louis, Mo.
Sellers Manufacturing Company, Chicago.
Templeton, Kenly & Co., Ltd., Chicago.
Union Switch & Signal Company, Swissvale, Pa.
Verona Tool Works, Pittsburgh, Pa.
Warren Tool & Forge Company, Warren, Ohio.
Wharton, William, Jr., & Co., Inc., Easton, Pa.
Wyoming Shovel Works, Wyoming, Pa.

The Material Market

IN THE iron and steel industry there has been a marked cessation of the buying in which price has been no object. As seen in the table below, the minimum prices are generally higher, but the premium prices for immediate delivery either are considerably lower or have disappeared entirely. Structural steel awards during the month of April represented 80 per cent of the capacity of the shops, compared with 96 per cent for the month of March. This is reflected in the more conservative character of prices for plates, shapes, and bars. Business in track materials, particularly in rails continues active, but there has been no tendency to increase prices. Recent rumors of advances in the price of rail have apparently been discredited.

Prices in Cents Per Pound

	April 20		May 20	
	Pittsburgh	Chicago	Pittsburgh	Chicago
Track spikes	3.15	3.25	3.15	3.25
Track bolts	4.00 to 4.50	4.25	4.25 to 4.50	4.25
Angle bars	2.75	2.75	2.75	2.75
Tie plates, steel	2.55 to 2.60	2.60	2.55 to 2.60	2.60
Tie plates, iron		2.85		2.85
Plain wire	2.65 to 3.00	2.99 to 3.34	2.75	3.09
Wire nails	2.90 to 3.10	3.24 to 3.44	3.00	3.34
Barbed wire, gal.	3.70 to 3.90	4.04 to 4.24	3.80	4.14
C. I. pipe, 6 in. or larger, per ton		$57.20		$60.20
Plates	2.45 to 2.90	2.50 to 3.19	2.50 to 2.60	2.60 to 2.94
Shapes	2.45 to 2.60	2.50 to 3.19	2.50 to 2.60	2.60 to 2.94
Bars, soft steel	2.35 to 2.75	2.40 to 3.19	2.40 to 2.50	2.50 to 2.84
Open hearth rail per gross ton f. o. b. mill				$43.00

There has been a further reduction in the prices of various scrap items as indicated in the table below.

	Prices Per Gross Ton at Chicago	
	April	May
Relaying rails	$32.00 to $35.00	$32.00 to $35.00
Rerolling rails	24.00 to 24.50	21.00 to 21.50
Rails less than 3 ft. long	26.00 to 26.50	22.50 to 23.00
Frogs and switches cut apart	22.50 to 23.00	19.00 to 19.50
	Per Net Ton	
No. 1 railroad wrought	20.00 to 20.50	21.00 to 21.50
Steel angle bars	22.00 to 22.50	19.50 to 20.00

While the movement of lumber continues large as indicated by an average weekly loading of about 77,000 cars of forest products per week, as compared with 56,000 cars a year ago, there has been a notable decrease in lumber orders, especially in southern pine territory as compared with last year. Orders on hand for southern pine mills, compare favorably with last year, but whereas there was a marked increase in the volume of orders on hand during the months of April and May of last year, there has been a decrease in the orders on hand during the corresponding months of this year. As the consequence, the general average of wholesale prices for lumber has remained stationary during the last month, although the selected items shown below indicate some advances.

Southern Pine Mill Prices

	April	May
Flooring, 1x4, B and B. flat	$53.65	$53.05
Boards, 1x8, No. 1	39.00	43.25
Dimension, 2x4, 16, No. 1 common	32.15	31.95
Dimension, 2x10, 16, No. 1	32.60	32.90
Timbers, 4x4 to 8x8, No. 1	29.80	31.35
Timbers, 10x10 to 12x12, rough	42.59	.....

Douglas Fir Mill Prices

Flooring, 1x4, No. 2, clear, flat	44.00	42.00
Boards, 1x6, 6x20, No. 1, common	20.50	19.50
Dimension, 2x4, 16, No. 1, common	23.50	23.50
Dimension, 2x10, 16, No. 1, common	23.50	21.50
Timbers, 6x6 to 8x8, No. 1, common	25.00	24.00
Timbers, 10x10 to 12x12, rough	26.50	26.00

No changes have been reported in the current prices of Portland cement. The following are current prices per barrel in carload lots not including package:

Chicago	$2.20	Duluth	$2.14
Cincinnati	2.54	Milwaukee	2.37
Davenport	2.43	Minneapolis	2.39
Detroit	2.47	Pittsburgh	2.24

General News

President Harding will drive a golden spike celebrating the completion of the Alaskan Railroad when he visits the territory this summer. Plans for a jubilee have been completed by the citizens of Alaska in commemoration of the construction of this railroad.

The Virginian Railway will electrify 134 miles of line, including 213 miles of track, between Roanoke, Va., and Mullens, W. Va. The division to be electrified crosses the Allegheny mountains and includes a 2 per cent grade, compensated, from Elmore to Clarks Gap. The undertaking will involve the expenditure of $15,000,000. The contract for electric locomotives, power house equipment, transformer stations and other electric apparatus has been awarded to the Westinghouse Electric & Manufacturing Company.

By an arrangement between the Georgia School of Technology, Atlanta, Ga., and the Central of Georgia, the students will be able henceforth to earn their way through school by enrolling in what is known as the "Co-operative Plan of Engineering," providing for four weeks of classroom work and four weeks in the Central of Georgia shops. This plan leads to graduation in five years instead of the usual four years. The student apprentices are regular employees of the railway and are entitled to transportation, group life insurance, pension benefits and other features.

The Delaware & Hudson, on April 23, celebrated the one-hundredth anniversary of its incorporation, having been organied by an act of the legislature of the State of New York on April 23, 1823, to mine and distribute anthracite coal. Until 1867, the company continued primarily as a canal company, although in 1827 it began and completed in 1829 the construction of a modified form of rail line between Carbondale and Honesdale, Pa., which consisted of a series of inclines up which cars were hauled by cables. It was upon this line that the America and Stourbridge Lion, the first steam locomotives used on the American continent, were tried out.

Freight traffic in April was approximately 31 per cent greater than for the same month one year ago, according to reports of the American Railway Association. The total for the month was 3,763,963 cars, representing an increase of 900,547 cars over the loadings for April, 1921. Car loadings of merchandise and miscellaneous freight, which includes manufactured products, showed an increase of 13 per cent, with grain and grain products showing an increase of 18 per cent. An increase of 5,110 cars, or 38 per cent, is reported for loadings in forest products, while practically a 100 per cent increase took place in ore loading. Except for grain and grain products which showed a slight decrease, the loadings of all commodities were larger during the first four months of this year than for the corresponding period of 1922.

An unusual problem in bridge engineering is being solved by the Louisville & Nashville in the construction of a new bridge across Great Rigolets, a connection between the Gulf of Mexico and Lake Pontchartrain, 31 miles from New Orleans. The bridge is in a location where it is subjected to the action of violent tropical storms, resulting in exceedingly high wind velocity and extremely severe tidal wave action. To meet this situation the piers, which will support the 330 ft. steel spans and one swing span 414 ft. long, have been made circular, 28 ft. in diameter. Owing to the great depth to which it will be necessary to carry the foundations, the piers are being constructed with an open well in the center 16 ft. in diameter so that they may be sunk by the open dredging method. It is expected that the piers will be sunk to a depth of from 78 to 113 ft. below mean sea level.

Frank McManamy, manager of the Department of Equipment in the division of liquidation of claims of the Railroad Administration, was apponted on May 11, for the term of one year, as a member of the Interstate Commerce Commission, to succeed Winthrop M. Daniels, resigned to become Strathcona Professor of Transportation at Yale University. The appointment is subject to confirmation by the Senate. While with the U S. Railroad Administration as manager of the Locomotive Section, and later as mechanical assistant to the director of the Division of Operation, with jurisdiction over car repairs and inspection, Mr. McManamy took an active part in the negotiation of the national agreement with the shop crafts and the abolition of piece work. His first railway experience was in connection with maintenance of way, he having entered this department of the Pennsylvania in 1886.

An outline of the methods followed and work done by the Interstate Commerce Commission in ascertaining the value of railroad property, together with a statement of the progress made, has been furnished to Senator LaFollette in response to a series of questions submitted by him to the commission, which includes the following statement showing the number of properties with miles of rail owned, for which the accounting, engineering or land reports, or some combination of these reports, were filed at the close of work on March 23, 1923:

	Representing corporations	Miles of road owned
Accounting, engineering and land reports filed	1,035	158,088
Accounting and engineering reports filed	33	25,128
Accounting and land reports filed	31	1,034
Engineering and land reports filed	72	3,844
Engineering report only	136	12,436
Land report only	57	2,694
Total properties for which some report has been filed	1,364	203,226
Recapitulation—		
Accounting reports filed	1,099	184,250
Engineering reports filed	1,276	199,496
Land reports filed	1,195	165,660

The progress made by railroads in carrying out the program established by the American Railway Association to provide adequate transportation this year shows that in the four months since the first of the year the roads have moved the heaviest traffic on record for this period by more than 10 per cent, that they have placed in service 50,151 new freight cars, and 1,228 locomotives, and are waiting delivery on 115,756 freight cars and 1,956 locomotives. The report also shows that the roads have reduced the number of freight cars awaiting repairs from 9.5 per cent of the total owned to 9.2 per cent, while the number of locomotives awaiting repairs has been reduced from 24.1 per cent of the total owned to 22 per cent, the railroads having also increased their fuel stock from 6,756,886 tons to 7,461,348 tons, thus releasing equipment which otherwise would be necessary to haul coal. The serviceable locomotives on May 1 totaled 50,279, or an increase of 152 over the total number on April 1, when the previous record was established. The number of locomotives in need of heavy repair on May 1 was 699 less than on April 15.

Personal Mention

General

R. N. Begien, general manager of the Baltimore & Ohio, Western Lines, with headquarters at Cincinnati, Ohio, and for many years in engineering service on that road and other lines, has been appointed operating vice-president of the Chesapeake & Ohio. A sketch of Mr. Begien's career appeared in the April issue, page 149.

H. B. Voorhees, general manager of the New York terminal properties of the Baltimore & Ohio, with headquarters at New York, has been promoted to general manager of the Western Lines of that road, with headquarters at Cincinnati, Ohio, succeeding R. N. Begien, resigned to accept service with another company. Mr. Voorhees was born on January 22, 1876, and graduated from Rensselaer Polytechnic Institute, Troy, N. Y., in 1896. He then entered railway service as an assistant supervisor on the Philadelphia & Reading, with headquarters at Tamaqua, Pa., being promoted to supervisor on March 1, 1898, to assistant trainmaster on August 1, 1898, and to trainmaster on October 1, 1900. On December 1, 1901, he entered the service of the Baltimore & Ohio as an assistant engineer at Pittsburgh, Pa. On August 1, 1902, he was promoted to division engineer at Baltimore and on September 1, 1903, to assistant to general superintendent of transportation. On February 1, 1905, he was appointed superintendent and general agent at Philadelphia, since which time he has been in the operating department as assistant to the president, general superintendent of transportation, general superintendent, and since September 1, 1919, general manager of the New York terminal lines and vice-president and general manager of the Staten Island Rapid Transit Railway.

L. S. Rose, assistant to the general manager of the Cleveland, Cincinnati, Chicago & St. Louis, and for several years a division engineer maintenance of way on that road, has been appointed general manager of the Peoria & Eastern (a subsidiary of the Big Four), with headquarters at Indianapolis, Ind. This is a newly created position brought about by the separation of this road from the Big Four for operating purposes. Mr. Rose was born in October, 1868, and graduated from Rose Polytechnic Institute in 1892. He entered railway service as a telegraph messenger with the Delaware & Hudson Canal Company in 1882. From 1892 to February, 1897, he was a rodman and assistant engineer on the Big Four, being promoted to supervisor of track in February of the latter year. On September 1, 1899, he was promoted to acting engineer maintenance of way at Mt. Carmel, Ill. On April 1, 1901, he was appointed engineer maintenance of way of the St. Louis division, with headquarters at Mattoon, Ill., where he remained until June 1, 1907, when he was promoted to signal engineer of the Big Four and the Peoria & Eastern. On November 1, 1913, he was appointed valuation engineer of these roads and on September 1, 1918, was appointed assistant to the federal manager, his title being changed to assistant to the general manager at the end of Federal control on March 1, 1920.

Engineering

Wendell P. Ball has been appointed engineer in charge of maintenance of the Pittsburgh & West Virginia and the West Side Belt Railroad, with headquarters at Pittsburgh, Pa.

R. W. E. Bowler, supervisor of track on the Pennsylvania System, with headquarters at Washington, D. C., has been promoted to division engineer, with headquarters at Grand Rapids, Mich.

J. L. Maher, assistant division engineer on the Baltimore & Ohio, with headquarters at Connellsville, Pa., has been promoted to assistant engineer of the Pittsburgh division, with headquarters at Pittsburgh, Pa.

H. L. Hunter, division engineer of the Illinois division of the Atchison, Topeka & Santa Fe, with headquarters at Chillicothe, Ill., has been promoted to office engineer with headquarters at Topeka, Kan. T. H. McGibben has been appointed division engineer of the Illinois Division with headquarters at Chillicothe, succeeding Mr. Hunter.

R. C. Williams, assistant engineer in the office of the engineer of bridges of the Illinois Central, with headquarters at Chicago, has been appointed assistant engineer of the Kentucky division, with headquarters at Louisville, Ky., succeeding **C. J. Carney,** who has been appointed to a new position as noted elsewhere in these columns.

J. W. Webster, assistant engineer of maintenance on the Elgin, Joliet & Eastern, has been transferred to terminal construction work at Joliet, Ill. **V. Benson,** assistant chief draftsman has been appointed assistant engineer of maintenance, succeeding Mr. Webster. **J. Davis,** instrumentman, has been promoted to assistant engineer in charge of double track construction.

T. Lees, engineer of water service on the Canadian Pacific, with headquarters at Winnipeg, Man., has been promoted to district engineer of the Alberta district, with headquarters at Calgary, Alta., succeeding **H. Rindal,** who has resigned. **C. H. Fox,** division engineer, with headquarters at Winnipeg, Man., has been promoted to engineer of water service, with the same headquarters, succeeding Mr. Lees.

T. E. Nestor, supervisor of track on the Pennsylvania, with headquarters at New Brunswick, N. J., has been promoted to division engineer of the Akron division at Akron, Ohio, succeeding **R. R. Metheany,** who has been transferred to the Monongahela division, with headquarters at Uniontown, Pa. Mr. Metheany succeeds **J. G. Hopkins,** who has been transferred to the Baltimore division, with headquarters at Baltimore, Md.

Henry Black Stuart, whose appointment as bridge engineer of the Central region of the Canadian National, with headquarters at Toronto, Ont., was noted in the April issue, was born on June 12, 1870, at Montreal, Que., and graduated in civil engineering from McGill University in 1892. He entered railway service in April, 1891, as an instrumentman on the Grand Trunk, which position he held until September of that year when he returned to college. After graduation he again entered the service of the Grand Trunk as assistant division engineer at Toronto, Ont., and in October, 1892, went with the Canada Switch & Spring Works at Montreal as a special designer of street intersections. In November, 1893, he returned to the Grand Trunk as inspector of bridges, designs and general maintenance, and since 1915 has also had charge of building work by company forces.

John H. Kelly, engineering assistant on the New York Central, has been promoted to assistant division engineer, with headquarters at Utica, N. Y. Mr. Kelly was born on August 9, 1891, at Fonda, N. Y., and received his engineering education at Renseelaer Polytechnic Institute, Troy, N. Y. He entered railway service in the engineering corps of the division engineer of the New York Central at Albany, N. Y., in August, 1912. In 1913 he was promoted to engineering assistant on Sub-division 6, between Schenectady, N. Y., and Herkimer, where he remained until August 24, 1917, when he obtained a leave of absence to enter the service of the United States Army, later sailing for France as a lieutenant of artillery on January 10, 1918. Following an active participation in the various drives of the American Expeditionary Forces and receiving several decorations and citations he returned to this country on September 3, 1919, resuming his position as engineering assistant on October 12 of the same year. He continued in service as engineering assistant until his recent promotion as noted above.

S. L. Church, whose promotion to engineer maintenance of way of the Illinois division of the Pennsylvania, with headquarters at Chicago, was noted in the May issue, was born on August 13, 1881, at Middletown, Conn., and graduated from Sheffield Scientific School, Yale University, in 1903. He entered railway service on July 8 of that year

as a transitman on the Buffalo & Allegheny division of the Pennsylvania. In August, 1905, he was transferred to Altoona, Pa., and in May, 1906, was promoted to assistant supervisor, with headquarters at Wilkes-Barre, Pa. From 1912 to July, 1917, he was supervisor in the office of the assistant general manager, with headquarters at Philadelphia, Pa., and on the latter date became division engineer of the Delaware division, with headquarters at Wilmington, Del., being transferred to the Conemaugh division, with headquarters at Pittsburgh, Pa., in February, 1918. Later he was successively transferred to the Maryland and the Baltimore divisions and was serving as division engineer of the Baltimore division, with headquarters at Baltimore, Md., when promoted.

Grover H. Wilsey, whose appointment as principal assistant engineer in charge of the design and construction of the new passenger terminal of the St. Paul Union Depot Company, with headquarters at St. Paul, Minn., was noted in last month's issue, was born on November 28, 1885, at Lena, Ill. He graduated from Armour Institute of Technology in 1908 and in October, 1908, entered the service of the Chicago, Milwaukee & St. Paul as a draftsman in the bridge and building department. From December, 1909, to May, 1911, he was a draftsman in the bridge department of the Chicago & North Western, on the latter date becoming structural designer for D. H. Burnham & Co., architects, Chicago. In March, 1915, he became structural designer for the St. Paul Union Depot Company, which position he held until February, 1916, when he became structural designer for the Toltz Engineering Company, St. Paul, Minn. He returned to the St. Paul Union Depot Company in April, 1917, as structural engineer in charge of the design of structures, the position he held at the time of his recent appointment.

John Attwill Ellis, whose appointment as assistant engineer of roadway standards of the Canadian National, with headquarters at Montreal, Que., was announced in the May issue, was born on October 15, 1882, at Arbroath, Scotland. He was educated at the City and Guilds Central Technical College, London, and entered railway service in 1903 on construction with the Great Northern, Picadilly & Bromton. In 1904 and 1905 he served as an assistant on a surveying staff for the Great Northern (England). Then for a short time he served as assistant on the signal engineering staff. From 1905 to 1909 he was subdistrict officer on maintenance for the Oudh & Rohilkhand, India. In 1909 and 1910 he was subdistrict officer on construction for the same company and in 1911 entered the service of the Canadian Northern as a leveler on construction and location. In the following year he entered the service of the Canadian Pacific as transitman on location. From 1912 to 1915 he was resident engineer on construction and from 1915 to 1918 he was assistant engineer in the Canadian Government Railways, and from the latter year to 1921 office engineer on the Canadian National.

S. A. Seeley, assistant division engineer on the New York Central, has been promoted to division engineer of the Adirondack-Ottawa division, with headquarters at Utica, N. Y. **John H. Kelly,** assistant supervisor of track, with headquarters at Fonda, N. Y., has been promoted to assistant division engineer, succeeding Mr. Seeley, with headquarters at Utica. Mr. Seeley was born at Jersey Shore, Pa., on May 22, 1877, and entered railway service as a clerk on the New York Central on December 1, 1900. After serving in the successive two years as chainman and rodman, he was promoted on May 1, 1902, to assistant general foreman of track. On November 1, 1903, he was promoted to transitman and later, on June 1, 1904, to draughtsman, remaining in this position until June 1, 1906, when he was promoted to assistant supervisor of bridges. On April 30, 1907, he was promoted to general foreman of bridges, serving in this capacity until May 15, 1910, when he was promoted to supervisor of bridges and buildings on the Adirondack division. On January 15, 1912, Mr. Seeley was transferred to the St. Lawrence division, where he remained until March 1, 1917, when he was promoted to assistant division engineer on the Adirondack division, the position he held at the time of his recent promotion.

R. W. Hunter, assistant engineer on the Atlantic Coast Line, has been promoted to division engineer in the construction department, with headquarters at Florence, S. C. Mr. Hunter was born on July 20, 1882, at Topeka, Kan., and entered railway service as an axeman in the engineering corps of the Louisville & Nashville in October, 1902. In June, 1903, he was promoted to masonry inspector, serving in this capacity until June, 1904, when he was promoted to assistant resident engineer, serving in this capacity until October, 1909, when he was promoted to resident engineer. In November, 1914, he left the employ of the Louisville & Nashville to become highway engineer in Lincoln County, Tenn., and subsequently superintendent of the Charleston Engineering & Construction Company at Charleston, S. C., where he remained until July, 1916, when he returned to the Louisville & Nashville as a valuation pilot. About a year later, in 1917, Mr. Hunter was commissioned first lieutenant in the Engineer Reserve Corps of the United States Army, serving in this country and overseas until his discharge on September 30, 1920. In October, 1920, he was appointed superintendent of streets of the city of Newport News, Va., and later director of public works of the same city, where he remained until July, 1922, when he left this work to become construction superintendent of the Noland-Clifford Company at Newport News. In February, 1923, he returned to railroad service as an assistant engineer on the Atlantic Coast Line, which position he held at the time of his recent promotion.

Track

E. J. Clopton, transitman on the Baltimore & Ohio, with headquarters at Pittsburgh, Pa., has been promoted to track supervisor, with headquarters at Philadelphia, Pa.

Henry O. Quigley has been promoted to supervisor of track on the New York, New Haven & Hartford, with headquarters at Boston, Mass., succeeding **Jeremiah Murphy** who has retired.

E. L. Wigglesworth has been appointed supervisor of painting on the Chesapeake & Ohio. **F. C. Lowry** has been appointed supervisor of station grounds. Both of these positions are newly created and have system jurisdiction.

H. J. Davall, supervisor of track on the Pennsylvania System, with headquarters at Jamesburg, N. J., has been transferred to Washington, D. C., succeeding **R. W. E. Bowler,** promoted to division engineer as noted elsewhere in these columns.

J. H. Wahlman has been promoted to assistant supervisor of track on the Boston & Albany, with headquarters at Boston, Mass., succeeding **H. H. Groves.** **J. F. Foley** has been promoted to assistant supervisor of track, with headquarters at Worcester, Mass., succeeding **Allan Curtis.**

C. J. Carney, assistant engineer of the Kentucky division of the Illinois Central, with headquarters at Louisville, Ky., has been appointed assistant roadmaster of the same division, with the same headquarters. **W. R. Gillam,** assistant engineer in charge of the lake front improvement work, with headquarters at Chicago, has been appointed assistant roadmaster of the Chicago Terminal, with the same headquarters.

S. Jenson, whose appointment as roadmaster on the First district of the Cascade division of the Great Northern, with headquarters at Tye, Wash., was noted in the April issue, was born in Norway on December 8, 1879, and attended college in Bergen, Norway. He entered railway service in 1901 on the Chicago & North Western and in 1903 entered the service of the Southern Pacific. He was subsequently employed on the Great Northern and the Spokane & International.

C. M. Shallenberger, assistant supervisor of track on the Pittsburgh division of the Pennsylvania, with headquarters at East Liberty, Pittsburgh, Pa., has been promoted to

supervisor of track on the Allegheny division, with headquarters at Kittanning, Pa., succeeding **L. St. C. Pie,** who has been transferred to the New York division, with headquarters at New Brunswick, N. J., succeeding **T. E. Nestor,** promoted to division engineer as noted elsewhere. **D. M. Weaver,** assistant supervisor of track on the Allegheny division, has been transferred to the Pittsburgh division, succeeding Mr. Shallenberger.

Mr. Shallenberger was born on January 18, 1888, at Pittsburgh, Pa., and was graduated from the University of Pennsylvania in civil engineering in 1910. He entered railway service as an assistant on an engineering corps on the Pittsburgh division of the Pennsylvania Lines West on October 1, 1911. He was subsequently promoted to assistant supervisor of track on the Pittsburgh Terminal division, being later transferred to the Conemaugh division and to the Pittsburgh division, with headquarters at East Liberty, Pittsburgh, Pa., where he remained until his recent promotion to supervisor of track as noted above.

Carl E. Gosline, notice of whose promotion to track engineer on the Delaware, Lackawanna & Western, with headquarters at Hoboken, N. J., appeared in a previous issue, was born at Beaver, Pa., on February 14, 1880, and graduated from the Pennsylvania State College in 1906. Entering railway service in 1902 he was employed at intervals as an assistant in the engineer corps on the Pittsburgh division of the Pittsburgh, Cincinnati, Chicago & St. Louis and in 1906 was employed by the Buffalo & Susquehanna as a transitman on new construction. In 1907 he returned to the Pittsburgh, Cincinnati, Chicago & St. Louis and remained there until 1908 when he went to work for the Chicago & Eastern Illinois as an assistant in the engineering corps. From July, 1908, to November, 1909, he served as the treating inspector, first on the Chicago & Eastern Illinois and subsequently on the Chicago, Rock Island & Pacific. In November, 1909, he left the Rock Island to become the treating inspector for the Delaware, Lackawanna & Western, remaining in this position until May, 1921, when he was promoted to roadmaster, with headquarters at Hoboken, the position he held at the time of his recent promotion to track engineer.

G. M. Smith, assistant to the engineer of track of the New York Central Lines East, with headquarters at New York, has been promoted to supervisor of track, with headquarters at Frankfort, N. Y., succeeding **A. M. Egan,** transferred to Hudson, N. Y., in place of **H. N. McGill,** deceased. Mr. Smith was born at Youngdale, Pa., on September 3, 1885, and entered railway service as a chainman on the New York Central on June 3, 1903, where, with the exception of two years when he was out of railway service, he served consecutively as chainman, rodman and draftsman, being transferred in the latter capacity to New York on July 1, 1912. On February 15, 1915, he was promoted to assistant supervisor of track on the Mohawk division, with headquarters at West Albany, N. Y., being transferred later to New York, where he remained until September 1, 1920, when he was promoted to assistant to the engineer of track, with the same headquarters. On March 16, 1921, he was appointed assistant supervisor of track on the Eastern division, serving in this position until July 1, 1921, when he was again appointed assistant to the engineer of track, which position he held at the time of his recent promotion to supervisor of track as noted above.

Bridge and Building

Frank Ingalls, supervisor of bridges and buildings on the Northern Pacific, with headquarters at Jamestown, N. D., will be retired on pension July 1.

F. H. Chapin, formerly with the Alaska Engineering Commission, has been appointed bridge engineer of the Alaska Railroad, with headquarters at Anchorage, Alaska.

R. E. Dailey, chief tie inspector on the Norfolk & Western, has been promoted to supervisor of bridges and buildings, with headquarters at Lynchburg, Va., succeeding **L. D. Smith,** who has retired.

J. L. MacDonald has been appointed assistant general supervisor of bridges and buildings for the Colorado lines of the Denver & Rio Grande Western, with headquarters at Denver, Colo., succeeding **Sol Slayback,** resigned.

T. H. Durfee, supervisor of bridges and buildings on the Chicago & North Western, with headquarters at Huron, S. D., has been transferred to Antigo, Wis. **F. E. Shanklin,** supervisor of bridges and buildings, with headquarters at Chadron, Neb., has been transferred to Madison, Wis., succeeding **W. H. Mulcahy,** retired.

Paul Paulson, whose promotion to supervisor of bridges and buildings on the Dakota division of the Chicago & North Western, with headquarters at Huron, S. D., was noted in the May issue, was born on June 27, 1873, in Sweden. Mr. Paulson was hoisting engineer for Widell & Co., of Mankato, Minn., for eight years, following which, in April, 1903, he entered railway service as pile driver engineer on the Chicago & North Western, in which capacity he served until August, 1914, when he was appointed foreman. In July, 1920, he was promoted to assistant supervisor of bridges and buildings on the Dakota division, and when this position was abolished was appointed traveling mechanic and road foreman of the water supply department, in which capacity he was serving at the time of his recent promotion.

J. F. Leonard, whose promotion to engineer of bridges and buildings of the Pennsylvania, with headquarters at Pittsburgh, Pa., was announced in the May issue, was born in 1879 at Salisbury, Md., and graduated from Lehigh University in 1905. He entered railway service in the bridge department of the Pennsylvania Lines West, of Pittsburgh, and in 1910 left this company to enter the service of the Aluminum Company of America on construction and plant operation at Niagara Falls, N. Y. The following year he returned to the service of the Pennsylvania as assistant engineer of bridges. During the war he served as a first lieutenant of the Twenty-second Engineers with the A. E. F. In July, 1919, he returned to his duties with the Pennsylvania as assistant engineer of bridges and buildings, which position he held at the time of his recent promotion.

Purchases and Stores

A. V. B. Gilbert has been appointed purchasing agent of the Atlanta, Birmingham & Atlantic, with headquarters at Atlanta, Ga., succeeding A. D. Daniel, promoted.

Obituary

Homer N. McGill, supervisor of track on the New York Central, with headquarters at Hudson, N. Y., died on April 12. Mr. McGill was born at Germantown, N. Y., on March 3, 1866, and entered railway service as a laborer on the New York Central. On January 1, 1893, he was promoted to section foreman and on April 1, 1902, to supervisor of track at Hudson, where he remained until the time of his death.

W. H. Myers, retired vice-president of the Pennsylvania and at one time an engineer, died at Redlands, Cal., on April 30. Mr. Myers was born in San Antonio, Tex., on April 9, 1856, and was educated at the School of Mines, Freiburg, Germany. He entered the service of the Pennsylvania in 1876 as a rodman at Altoona and shortly afterwards became assistant supervisor and then supervisor at main line points between Philadelphia and Harrisburg. He subsequently served on various divisions as assistant engineer and was advanced to superintendent of the Bedford division in 1889, afterwards acting in that capacity on the Belvedere, Schuylkill and Middle divisions. In 1900 he became general superintendent of the Philadelphia & Erie and the Northern Central, two of the company's subsidiaries. In 1909 he was promoted to general manager and two years later he became fifth vice-president. In 1912 he was appointed vice-president in charge of real estate, pur-

chases and insurance. Mr. Myers retired from active service on March 1, 1920.

A. McNab, supervisor of bridges and buildings on the Chicago and Grand Rapids division of the Pere Marquette, with headquarters at Holland, Mich., died at his home in that city on May 23, after a brief illness. Mr. McNab would have completed 50 years of service with the Pere Marquette in August of this year.

Niel McLean, bridge inspector on the Erie, with headquarters at Huntington, Ind., died recently.

Miscellaneous

R. M. Barton, a member of the public group on the Railroad Labor Board since its reorganization in 1922, and its first chairman, and Horace Baker, formerly general manager of the Cincinnati, New Orleans & Texas Pacific, and who has also been a member of the railway group on the board since its organization, were reappointed for an additional term as announced by President Harding on May 11. At the same time **E. F. Grable**, formerly grand president of the United Brotherhood of Maintenance of Way Employees and Railway Shop Laborers, and at one time a supervisor of bridges and buildings, was appointed a member of the labor group on the board, succeeding Albert Phillips. Mr. Grable was born on November 12, 1866, in Cass County, Indiana, and attended a college at Paxton, Ill., for two terms. He entered railway service on August 7, 1895, as a carpenter on the Illinois Central, being promoted to carpenter foreman in 1899 and to supervisor of bridges and buildings on January 2, 1902. He left the service of the Illinois Central in March, 1907, to become building inspector on the Missouri Pacific, but in October, 1909, returned to the Yazoo & Mississippi Valley as division carpenter foreman. Mr. Grable was elected general chairman of the Brotherhood of Maintenance of Way Employees for the Illinois Central in August, 1916, and was elected grand vice-president of the amalgamated organization, the United Brotherhood of Maintenance of Way Employees and Railway Shop Laborers, in September, 1918, and in March, 1920, was elected grand president of the organization. Mr. Grable was instrumental in securing the intervention of President Harding in the strike of the shop crafts last summer, and through his withholding approval of the vote of the maintenance of way men in his organization in favor of a strike prevented the spread of the tie-up to the maintenance of way departments. He was defeated for re-election as president of the brotherhood last fall.

E. F. Grable

About 11 per cent of the entire traffic of the country is handled by the Pennsylvania. A large proportion of this business converges in the Pittsburgh territory, the western Pennsylvania division comprising 114 miles of main line between Pittsburgh and Altoona with its branches, dispatching as many as 12,000 loaded cars daily and loading 4,300 cars of coal alone in addition to 1,200 cars of coke each day. The total daily freight movement over the Allegheny mountains is now about 3,200 cars eastbound, and 3,500 cars westbound, or a total of 6,700 cars daily. This is equivalent to more than two cars each way every minute of the 24 hours. The trains moving in each direction daily, if placed end to end, would cover over 26 miles of track.

Construction News

The Alaska Railroad has been authorized to build a spur 4½ miles long from the Matanuska branch of the Moose Creek coal mines.

The Ann Arbor will construct a new roundhouse and machine shop at Owosso, Mich.

The Atchison, Topeka & Santa Fe, the Chicago, Rock Island & Pacific, the St. Louis-San Francisco and the Missouri-Kansas-Texas, have been ordered by the Corporation Commission of Oklahoma, and their order has been sustained by the State Supreme Court of Oklahoma, to build a union station in Oklahoma City, Okla., and to eliminate grade crossings at that point.

The Atchison, Topeka & Santa Fe has authorized the construction of a 1,00-ton reinforced concrete coaling station at Argentine, Kan., and a 600-ton reinforced concrete coaling station at La Junta, Col. A new brick passenger station will be constructed at Cushing, Okla. Additions to the company hotels at Seligman, Ariz., and Williams have also been authorized. This company will construct an ice plant at Needles, Cal., with a daily capacity of 200 tons and storage capacity of 10,000 tons. Included in the project are the relocation of the present double tracks, the construction of additional track and water facilities.

The Baltimore & Ohio has awarded a contract to the Seaboard Construction Company, Philadelphia, Pa., for the erection of new superstructures for five bridges on the Ohio River district, Wheeling division, between Brooklyn Junction and Benwood, to consist of deck plate girder spans ranging in length from 80 to 100 feet. This company has also awarded a contract to the Pittsburgh Construction Company, Pittsburgh, for the erection of superstructures for a bridge crossing Boundary avenue, Pittsburgh, Pa., and a bridge crossing Stoney Creek, Hooversville, Pa., including plate girder spans ranging in length up to 106 feet.

This company is calling for bids for the construction of a brick freight house with concrete platforms at Pittsburgh, Pa., to cost $80,000.

The Buffalo, Rochester & Pittsburgh has awarded to the G. C. Cleaver Company, Punxsutawney, Pa., a contract for grading in connection with additions to its yard at Cloe, Pa. The company has awarded a contract to the Miller Construction Company, Punxsutawney, Pa., for the construction of additional passing sidings at Valier, Pa.

The Canadian Pacific has awarded a contract to E. B. Kimball for the construction of a branch line from Wymark, Sask., to Archive, reported in the May issue.

The Canadian Pacific has awarded a contract to Grant Smith & Company & McDonnell, Ltd., Vancouver, B. C., for grading on the first 50 miles of the Tuffnell branch, and a contract to W. A. Dutton, Winnipeg, for grading the first section of the Ymark branch.

The Chicago & North Western has awarded a contract to the Chicago Bridge & Iron Works, Chicago, for the construction of five water treating plants at Montamin, Iowa, Paterson, Laurens, Onawa and Boone, these plants to be equipped with International Filter Company, Chicago, machinery.

The Chicago & North Western has awarded a contract to the Howlett Construction Company, for the erection of a 250-ton frame coaling station at Belle Plaine, Ia., and a contract to the Roberts & Schaefer Company, Chicago, for a 150-ton automatic coaling station at Stambaugh, Mich.

The Chicago & North Western has awarded contracts to the Ogle Construction Company, Chicago, for two 600-ton reinforced concrete coaling stations at the Chicago shops and for a 250-ton concrete coaling station at Evansville, Wis.

This company, reported in the February issue as contemplating the construction of additional shop facilities at Madison, Wis., has authorized the construction of a 30-stall

roundhouse, machine shop, repair shop and a car foreman's shop and ice house. It has awarded the contract for the roundhouse and shop building to T. W. Gimble, Chicago, and a contract to Duffy & Jutton, Milwaukee, Wis., for the grading and track work on this project, which will include approximately five miles of storage and switching tracks. The work will cost approximately $500,000. This company has awarded a contract to G. A. Johnson & Sons, Chicago, for the construction of a roundhouse at Casper, Wyo., and has been ordered by the Railroad Commission of South Dakota to relocate its line through, and construct passenger and freight station facilities at, Newell, S. Dak.

This company has awarded contracts to Roberts Bros., Chicago, for grading for a third main track between Elmhurst, Ill., and West Chicago, a distance of approximately 15 miles, and to the Bates and Rogers Construction Company, Chicago, for the bridges on this project.

The Chicago, Burlington & Quincy closed bids on May 21 for the construction of a 50-ton coaling station at Clarinda, Ia. The company has awarded a contract to G. A. Johnson & Sons, Chicago, for the construction of a machine shop at Beardstown, Ill.

The Chicago, North Shore & Milwaukee (Electric) contemplates the re-location of its main line to Wilmette, Ill., and Winnetka. Negotiations are now under way for the purchase of land for the proposed right-of-way.

The Chicago, Rock Island & Pacific called for bids during the month for the constrution of a passenger station at Moline, Ill., also for bids for rebuilding of the roundhouse at Shawnee, Okla.

The Detroit, Toledo & Ironton has awarded a contract to F. R. Jones Company, Detroit, Mich., for the construction of a cut off to the River Rouge plant, as reported in the May issue.

The Elgin, Joliet & Eastern will construct a second track between Coyne's, Ill., and the Des Plaines River, a distance of five miles, to cost approximately $400,000.

The Fort Wayne Union will construct 8,000 feet of new line near Fort Wayne, Ind., to provide transfer facilities between various roads. This work will cost approximately $218,000.

The Fort Worth & Denver City contemplates the construction of a new paint and coach shop at Childress, Tex., to replace the building recently destroyed by fire, the work to cost approximately $225,000.

The Galveston, Harrisburg & San Antonio's plans for terminal and improvement work at El Paso, Tex., include the construction of an eight-stall addition to the roundhouse, an addition to the blacksmith shop, a new washroom and a new fuel oil station.

The Grand Trunk contemplates the construction of a freight classification yard at Trowbridge, Mich.

The Great Northern will construct seven miles of second track between Kandiyohi, Minn., and Atwater, at a cost of $350,000, and will enlarge the stockyards at Willmar, Minn., at a cost of $25,000.

The Illinois Central has awarded contracts to the Graver Corporation, Chicago, for the construction of water-treating plants at Parkersburg, Ia., Iowa Falls, Webster City and Dixon, Ill.

This company has awarded a contract to A. W. Stoolman, Champaign, Ill., for the construction of a brick passenger station at Vandalia, Ill., reported in the March issue, has authorized the construction of a brick freight and passenger station at Bethany, Ill., and the enlarging of the freight house at Cedar Rapids, Ia., and will construct a 300-ton coaling station at Council Bluffs, Ia., also a coaling hoist with standing facilities at East St. Louis, Ill. This company has awarded a contract to Joseph E. Nelson & Sons, Chicago, for the construction of an engine house at Central City, Ky., and contracts to the Ellington-Miller Company, Chicago, for the construction of a passenger depot at Morgansfield, Ky., and for the construction of foundation for the old passenger station at Champaign, Ill., which is to be re-located and used as an office building.

This company has authorized the construction of a 4,600-foot passing track at Iowa Falls, Ia., a 110-car capacity passing track at Galton, Ill., a 96-car passing track at Decatur, Ill., and 28,000 feet of storage track at Bloomington, Ind. This company has authorized the construction of storage tracks at Council Bluffs, Ia., 2,000 feet of passing track at Craneville, Ill., 4,000 feet of passing track at Bainbridge, Ill., 3,000 feet at Lementon and for two 60-car passing tracks at Marion, Ill. It has also awarded a contract to the Frazier Company, Lincoln, Ind., for the construction of seven miles of second track from Springfield, Ill., to Barclay, including a new double-track bridge across the Sangamon River near Spaulding, Ill., to cost $410,000. This company has authorized the extension of 10 passing tracks on the Springfield division and the construction of a second track between Clinton, Ill., and Salt Creek Spur.

The Inter-California has been authorized by the Interstate Commerce Commission to construct a branch line from Calipatria to a point 6.7 miles north of Holtville, Cal., 21.3 miles, to be operated jointly with the Southern Pacific.

The Louisville & Nashville contemplates the construction of 40 miles of second track between Pineville, Ky., and Harlan. This company, in conjunction with the Southern Pacific, will construct a levee along the Mississippi River at New Orleans, to cost approximately $100,000.

The Missouri Pacific has authorized the construction of a new machine shop at Wichita, Kan., to cost approximately $78,000, also the construction of facilities for handling fuel oil for locomotives, including storage at terminals and outlying points on the Arkansas, Louisiana and Memphis divisions, to cost approximately $350,000. This company has authorized the construction of a new brick passenger station at Washington, Mo., to cost $55,000, and contemplates the construction of a new eight-stall enginehouse at Osawatomie, Kan., to cost approximately $52,000, also the installation additions to an enginehouse at Van Buren, Ark., to cost approximately $72,000.

This company has authorized the construction of a viaduct at Fourteenth street, St. Louis, Mo., to cost approximately $130,000, the construction of four new piers for a bridge at Corning, Ark., and the raising and extension of a bridge at Kansas City, Kan., the latter to cost approximately $175,000.

This company has authorized the construction of extensions to 11 passing tracks on the Central Kansas-Colorado division, to cost $68,000 and the installation of industrial tracks at various points, the total cost of which will approximate $100,000. The purchase of land at Kansas City, Mo., for the construction of additional freightyard facilities has also been authorized. This company has plans to construct a waterstation and treating plant at Horace, Kan., to cost $55,000.

The Mobile & Ohio plans the construction of a new machine shop at Jackson, Tenn.

The New York Central will construct an additional car repair shop building at Adrian, Mich.

The New York, Chicago & St. Louis has awarded contracts to P. T. Clifford & Son, Valparaiso, Ind., for grade changes at Willvale, Ind., and for second track work at Raber, Ind.; also for the construction of a second main track from Fort Wayne, Ind., to Hadley, and from Fort Wayne to New Haven.

The Northern Pacific has awarded a contract to Winston Brothers, Minneapolis, Minn., for the construction of a 35-mile branch line in Montana, as reported in the March issue.

The Nueces Valley, Rio Grande & Gulf has applied to the Interstate Commerce Commission for authority to construct an extension from Beeville to Laredo, Texas.

The Osage Railway has been authorized by the Interstate Commerce Commission to construct an extension of approximately six miles from Foraker to Shidley, Okla., to the line previously authorized from Foraker to the Osage oil fields, 11 miles.

The St. Louis-San Francisco has awarded a contract to the Howlett Construction Company, Moline, Ill., for the erection of a 300-ton, reinforced concrete coaling station at East Thomas, Ala. This company is also calling for bids for the construction of a power house at Enid, Okla., and is calling for bids for the construction of the shop buildings at East Thomas, Ala., reported in the April issue.

This company has awarded a contract to the Grant Smith Company, St. Paul, Minn., for the construction of second track from Valley Park, Mo., to Eureka, reported in the February issue, and has awarded contracts to E. T. White, Kansas City, Mo., and John R. Scott, St. Louis, Mo., for the reduction of grade at Dixon, Mo., to cost $100,000.

The St. Louis-San Franciscso will open bids June 6 for the construction of terminal facilities in St. Louis, to include a 20-stall round house, machine shop, power plant and washrooms, to cost approximately $500,000. This company awarded a contract to John M. Olsen, Springfield, Mo., for the erection of a similar group of buildings at East Thomas, Ala., and has awarded contracts to E. G. Fike & Company, Tulsa, Okla., and J. W. McMurray Construction Co., Kansas City, Mo., for eight concrete culverts on the Southwestern division, and 27 culverts on the Southern and River division, respectively.

The San Antonio & Mexican, which has been incorporated in San Antonio, Tex., plans the construction of a line 170 miles long, from Three Rivers, Tex., via Mirando, to a point on the Rio Grande river, either Roma or Rio Grande City. A branch line to Laredo is also planned. It is understood that the new line will become a part of the San Antonio, Uvalde & Gulf when completed. A. R. Ponder, of San Antonio, Tex., receiver and general manager of the San Antonio, Uvalde & Gulf, is one of the incorporators.

The Southern contemplates the construction of a second track from Atlanta, Ga., to Birmingham, Ala. This company is reported to be planning the erection of a 10-story office building, 50 ft. by 100 ft., at Birmingham, Ala.

The Southern Pacific has been authorized by the Interstate Commerce Commission to construct a branch line from a point about four miles south of Bakersfield, Cal., to a site of a proposed packing house south of the village of Arvin, a distance of 17.64 miles. This company is constructing with its company forces a 16-stall roundhouse, machine shop, power house, car repair shed, mill building, oil house and an employees' building at Lafayette, La.

The Spokane International will reconstruct its tunnel at Bonner's Ferry, Wash., at a cost of approximately $75,000.

The Temiskaming & Northern Ontario will in August call for tenders for the completion of its extension north of Cochrane, Ont., from Tin Can Portage to Moose Factory on James Bay. The company also plans a new station at Haileybury to cost $30,000 and additions to offices at North Bay to cost from $60,000 to $75,000.

The Toledo Terminal Company has awarded a contract to the Roberts & Schaefer Company, Chicago, for the construction of a "N. & W." type electrically-operated cinder-handling plant at Toledo, Ohio.

The Union Pacific has applied to the Interstate Commerce Commission for a certificate authorizing the construction of a line from Ammon to Dumas, Ida., 10.8 miles, and for the construction of a 97 mile line from Rogerson, Ida., to Wells, Nev. This company will construct 53 miles of second track between Granger, Wyo., and Ogden, Utah, also another section of second track near Glenns Ferry, Ida. It contemplates the re-location of its track in Bakers County, Ore., the latter to cost in excess of $500,000. This company called for bids during the month for the construction of a brick passenger station at Hayes, Kans., to cost approximately $60,000.

The Washington Terminal Company has awarded a contract to the Ogle Construction Company, Chicago, for the construction of a 1200-ton, five-track, reinforced concrete coaling station with sanding facilities at Washington, D. C.

The Western Pacific has awarded a contract to W. A. Bethel, San Leandro, Cal., for the construction of an 8-mile branch line near Gerlach, Cal.

Supply Trade News

General

The Link Belt Company, Chicago, will construct a one-story machine shop 125 by 135 ft., to cost approximately $85,000.

The Jones & Laughlin Steel Corporation has purchased 319 acres of land near Hammond, Ind., on which a plant will be constructed.

The Gibb Instrument Company, Bay City, Mich., has taken over the distribution of the General Electric Company's arc welding electros for the middle west.

Joseph T. Ryerson & Son, Inc., has moved its offices from 910 Corn Exchange building, Chicago, to 1736 Illinois Merchants' Bank building.

The Gifford-Wood Company, Hudson, N. Y., has removed its Buffalo, N. Y., office to the People's Bank building, Pittsburgh, Pa.

The National Lumber Manufacturers' Association of Chicago has moved its offfce from the Harris Trust building to 2017 Conway building, 111 West Washington street.

Higgins & Company, representatives of the American Valve & Meter Company and the St. Louis Frog & Switch Company, have been appointed general sales agents in the United States for the Cook Standard Tool Company, Kalamazoo, Mich.

The Detroit Steel Products Company, Detroit, Mich., will establish a branch factory at Emeryville, Cal., which will have 83,000 sq. ft. of space. A. Lum has been appointed manager of the plant and will have charge of sales on the Pacific Coast.

The Truscon Steel Company has moved its Detroit, Mich., office to temporary headquarters in the Krolik building, 316 E. Jefferson street. Permanent quarters will be located in the new Truscon building now under construction at the northwest corner of W. Congress and Wayne streets.

The Railroad Supply & Equipment Exchange Corporation has been incorporated in Illinois for the purpose of erecting in Chicago a building to be used as the central headquarters for the railway supply trade of the United States. The company expects to erect a building which will be large enough to house permanent and transient exhibits of railway equipment and supplies and to provide office space for supply manufacturers and club rooms. Harry Vissering, president of Harry Vissering & Company, Chicago, is president; T. G. Kroehler is vice-president and R. W. Lyons is secretary and treasurer.

Personal

W. B. Fraser, one of the partners in the Coale-Fraser Lumber Company, Lytton building, Chicago, has assumed charge of the company's West Coast office, Tacoma, Wash.

F. V. Shannon has been appointed western manager of the Massey Concrete Products Corporation, in charge of the territory comprising the states of California, Oregon, Washington, Idaho, Nevada, Arizona, Utah, Wyoming and Montana, with offices at 65 Market street, San Francisco, Cal.

Robert W. Gwaltney, manager eastern sales of the T. H. Symington Company, New York City, has been appointed vice-president in charge of eastern sales, with headquarters at New York City. Mr. Gwaltney will also have supervision of the southern territory formerly handled in Baltimore by T. C. de Rosset, deceased.

George Adam Weber, director of the Rail Joint Company, New York, who died on March 29 at Pasadena, Cal., as noted in the May issue, was born in Como, Ill., in 1848, and received his early education in the public schools of Chicago. Later he graduated from Williston Seminary at Easthampton, Mass., and entered the class of 1872 at Yale. He invented the Weber rail joint in 1888 and the insulated joint in 1894. The Weber Rail Joint Manufacturing Company was formed

in 1889. In 1905 this company, together with the Independent Railway Supply Company and the Continuous Rail Joint Company of America, were merged into the Rail Joint Company. This consolidation permitted his retirement from active business.

Oliver W. Loomis, manager of sales of the National Malleable Castings Company, Cleveland, Ohio, has been appointed manager of the company's malleable plants at Chicago, with office at 2610 West Twenty-fifth place, succeeding O. J. Fehling, who has resigned. **James A. Slater,** assistant manager of sales, has been appointed manager of sales, with headquarters at Cleveland, to succeed Mr. Loomis. Mr. Loomis was born in Bloomington, Ill., and has been with the National Malleable Castings Company since March, 1891, having served consecutively in the accounting, manufacturing and sales departments. Mr. Slater has been in the service of the National Malleable Castings Company continuously for the past 26 years, serving in various capacities both in Cleveland and Chicago, in the purchasing and the sales departments.

J. R. Sexton, division engineer of the Erie, with headquarters at Huntington, Ind., has been appointed railway sales manager of the H. H. Robertson Company, with headquarters at Chicago. Mr. Sexton was born on January 18, 1888, at Long Branch, N. J., and graduated from Rutgers College in June, 1911. He entered railway service in 1910 as a rodman on the Lehigh Valley, and from August 1, 1911, to October 13, 1913, was subsequently chainman, rodman, instrumentman and inspector on the New York Central & Hudson River. On the latter date he resigned to become resident engineer on the Erie, which position he held until March 1, 1915, when he was promoted to assistant division engineer of the Mahoning division. From April 1, 1916, to May 1, 1917, he was division engineer of the Meadville division and from the latter date until March 1, 1920, was division engineer of the Marion and Chicago divisions. On March 1, 1920, he was promoted to regional engineer of the Chicago region, with headquarters at Chicago, Ill., which position he held until December 1, 1923, when, owing to the consolidation of regions, he was again appointed division engineer of the Marion and Chicago divisions, with headquarters at Huntington, Ind.

J. R. Sexton

Trade Publications

Portable Drills.—A bulletin has been issued by the Hisey-Wolf Machine Co., Cincinnati, Ohio, listing the Hisey line of portable electric drills and reamers with attachments and accessories. The bulletin contains diagrammatic and halftone illustrations of the various drills and includes full specifications as to size and performance, with recommendation as to the particular use for which each tool is adapted. The listing covers both hand and stand tools.

Combusco Ash Conveyor.—The Combustion Engineering Corporation, New York, has issued a large size, 12-page, illustrated booklet descriptive of a new type of ash conveyor for power plant and other uses. The text describes the various phases of its operation such as the automatic removal of ashes, the prevention of dust and fumes, the quenching, the maintenance of an air seal in the combustion chamber, etc., while the photographs illustrate numerous sections of typical installations.

Gas Engines.—The Noble Engine Company, Lansing, Mich., has issued a folder illustrating and describing its line of internal combustion engines arranged for various kinds of work. The illustrations show both portable and stationary combinations, in which the engine is shown adapted to operating centrifugal and plunger pumps as well as the diaphragm pumps. Also illustrated descriptions are given of various kinds of hoists and some attention is given to the use of air compressor combinations.

Ferro Carbon Titanium.—The Titanium Alloy Mfg. Company, Niagara Falls, N. Y., has issued a small 44-page booklet describing ferro carbon titanium and its function in the manufacture of steel. In addition to a detailed description of the properties of this alloy, this booklet contains valuable data comparing the properties of untreated steel with those of steel to which titanium has been added. Numerous photographs are also presented showing the properties of this metal.

Southern Pine.—The Southern Pine Association, New Orleans, La., has issued a large-sized, 12-page illustrated bulletin of technical and general information regarding southern pine and its uses. The text deals with the availability, distribution and grading rules of southern pine lumber; the methods of laying and caring for wood block and other types of flooring; and a number of tables of strengths of green and air-dried timber, approximate changes of properties, with changes of moisture content, etc.

Drill Steel.—The Sullivan Machinery Company has issued a handbook on rock drill steel containing detailed instructions for the proper installation, care and use of the Sullivan drill sharpeners and drill steel furniture, and information in a practical form concerning the heating, forging and tempering of drill steel for whatever purpose. The booklet is illustrated with photographs and drawings showing both the machinery for sharpening drills and the methods of procedure, as well as plans for drill sharpening layouts.

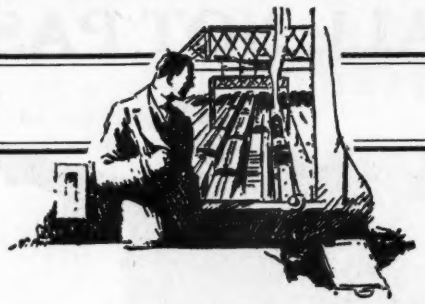
National Mathewson Joint Pipe.—The National Tube Company, Pittsburgh, Pa., has recently issued a large size, 64-page, well illustrated booklet descriptive of Mathewson joint pipe manufactured by this company. The text and illustrations give a full discussion of the design and construction of all forms of pipes using this form of joint as well as installation detail. In the latter part of the booklet are data relative to flow of water in pipes and covering such subjects as loss of head at entrance, loss of head through friction, obstruction, bends, etc.

Portable Loaders.—The Link-Belt Company, Chicago, has issued a 33-page booklet describing and illustrating its line of portable loaders for general and special uses. The bulletin includes descriptions of conveyor loaders equipped with bag filling devices, as well as portable machines adapted for use in series with each other and for indoor or outdoor work. Some attention is also given in the bulletin to the Link-Belt cranes. Full specifications of machines are furnished, together with a large number of halftone illustrations showing the machines in various kinds of work.

Erie Lubricated Caterpillar Mountings.—The Erie Steam Shovel Company, Erie Pa., has issued a large-size, 20-page, illustrated booklet devoted to a description of the lubricated caterpillar type mountings manufactured by this company. The text of this booklet describes in detail the methods of construction and classes of materials used, the manner in which the link pin lubrication and the bushing of the link pin bearings is secured as well as its protection. It also shows how Erie wheel type shovels and cranes can be converted into caterpillar types. Numerous photographs illustrate the points treated in the text.

A Discussion of Integral Waterproofing—Samuel R. T. Very, an architect, conducted some tests designed to show the effect of placing integral waterproofing compounds in concrete, and a report of these tests has been published by the Truscon Laboratories, Detroit, Mich., in an eight-page folder. The report is prepared in an attractive style and the conclusions are concisely presented, among which the most important is that integral waterproofing serves to reduce the importance of the personal equation in concrete work by eliminating the porosity which occurs in some measure in nearly all work performed under practical conditions.

Buyers' Guide



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Rock Drills.
Ingersoll-Rand Co.
Sullivan Machinery Co.
Verona Tool Works.

Rods, Welding.
Air Reduction Sales Co.

Roof Slabs.
Massey Concrete Prod. Corp.

Roofing, Asbestos.
Robertson Co., H. H.

Roofing Corrugated.
Robertson Co., H. H.

Roofing and Siding.
Fairbanks, Morse & Co.
Robertson Co., H. H.

Rules.
Lufkin Rule Co., The.

Saws, High Speed Friction.
American Saw Mill Co.

Scrapers, Wheeled, Drag & Buck.
Western Wheeled Scraper Co.

Screw Spike Drivers.
Ingersoll-Rand Co.

Sewer Pipe.
Massey Concrete Prod. Corp.

Sheets, Corrugated.
Robertson Co., H. H.

Sheets, Fibre.
Diamond State Fibre Co.

Sheet Iron.
Armco Culvert & Flume Mfrs. Assn.

Sheet Steel.
Inland Steel Company.

Shovels.
Wood Shovel & Tool Co., The.

Siding, Corrugated & Plain.
Robertson Co., H. H.

Signal Foundations, Concrete.
Massey Concrete Prod. Corp.

Skid Shoes.
Q & C Co.

Skylights.
Robertson Co., H. H.

Slabs, Concrete.
Massey Concrete Prod. Corp.

Smoke Stacks.
Chicago Bridge & Iron Works.
Massey Concrete Prod. Corp.

Snow Melting Devices.
Q & C Co.

Snow Plows.
Q & C Co.

Spikes.
Bethlehem Steel Company.
Inland Steel Co.

Spreaders.
Jordan Co., E. F.

Standard Tee Rails.
Bethlehem Steel Company.
Inland Steel Co.

Standpipes.
American Valve & Meter Co.
Fairbanks, Morse & Co.

Station Houses.
Massey Concrete Prod. Corp.

Steam Shovels.
American Hoist & Derrick Co.
Erie Steam Shovel Co.
Osgood Co., The.

Steel Forms.
Blaw-Knox Co.

Steel Plates and Shapes.
Bethlehem Steel Company.

Step Joints.
Q & C Co.
Rail Joint Co.

Street Railway Special Work.
Bethlehem Steel Company.

Structural Steel.
Bethlehem Steel Company.
Inland Steel Company.

Switches.
Bethlehem Steel Company.
Frog, Switch & Mfg. Co.
Ramapo Ajax Corp.
Weir Frog Co.
Wm. Wharton, Jr., & Co.

Switch Locks.
American Valve & Meter Co.

Switchmen's Houses.
Massey Concrete Prod. Corp.

Switchstands and Fixtures.
American Valve & Meter Co.
Bethlehem Steel Company.
Fairbanks, Morse & Co.
Ramapo Ajax Corp.
Weir Frog Co.
Wm. Wharton, Jr., & Co.

Tampers.
Ingersoll-Rand Co.

Tanks, Elevated Steel.
Chicago Bridge & Iron Works.

Tanks, Oil Storage.
Chicago Bridge & Iron Works.

Tank Valves.
American Valve & Meter Co.

Tapes.
Lufkin Rule Co., The

Telegraph Poles.
International Creosoting & Construction Co.
Massey Concrete Prod. Corp.

Telephone Booths.
Massey Concrete Prod. Corp.

Ties.
International Creosoting & Construction Co.

Tie Plates.
Bethlehem Steel Company.
Inland Steel Company.
Lundie Engineering Corp.

Tie Rods.
Bethlehem Steel Company.

Tin Plate.
Bethlehem Steel Company.

Tongue Switches.
Bethlehem Steel Company.

Tool Steel.
Bethlehem Steel Company.

Tools, Oxy-Acetylene Welding and Cutting.
Air Reduction Sales Co.

Torches, Oxy-Acetylene Welding and Cutting.
Air Reduction Sales Co.

Track, Portable.
Western Wheeled Scraper Co.

Track Drills.
Ingersoll-Rand Co.

Track Insulation.
Diamond State Fibre Co.
Q & C Co.

Track Jacks.
Verona Tool Works.

Track Liners.
Crowley & Co., Thomas D.

Track Material.
Inland Steel Company.
Ramapo Ajax Corp.
Weir Frog Co.

Track Scales.
Fairbanks, Morse & Co.

Track Tools.
Fairbanks, Morse & Co.
Q & C Co.
Verona Tool Works.

Trestle Slabs.
Massey Concrete Prod. Corp.

Vacuum Pumps.
Ingersoll-Rand Co.

Ventilators, Shop, Roundhouse
Robertson Co., H. H.

Washers.
Diamond State Fibre Co.

Water Column.
American Valve & Meter Co.

Water Softening Plants.
American Water Softener Co.

Welding, Oxy-Acetylene.
Air Reduction Sales Co.

Weed Killer.
Reade Mfg. Co.

Wheels (Hand and Motor Car).
Fairmont Railway Motors, Inc.
Maintenance Equipment Co.
Mudge & Co.
Woolery Machine Co.

Wire.
Armco Culvert & Flume Mfrs. Assn.

Wire Rope.
Fairbanks, Morse & Co.

Wood Preservative.
International Creosoting & Construction Co.
Reade Mfg. Co.

Zinc Chloride.
New Jersey Zinc Co.

ALPHABETICAL INDEX TO ADVERTISEMENTS

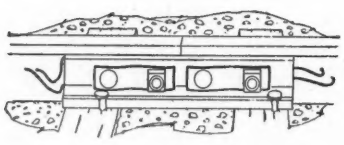
Read this "satisfaction guarantee"

ALL Verona Rail Joint Springs are sold with the following guarantee of complete satisfaction:

Apply Verona Rail Joint Springs on a stretch of main line track at least ten miles long. Compare their performance with the performance of nut-locks.

If at any time after six months and before one year, you are not completely satisfied, if you feel that they are not worth many times their slight additional first cost, return them to us, and we will accept them as cash at the full price you paid for them in payment for Verona nut-locks. We will pay the freight both ways on the exchange.

This ought to make your purchase of rail joint springs very safe. And it demonstrates, better than anything else we could say or do, our supreme confidence in their merit.



VERONA TOOL WORKS Pittsburgh New York Chicago Boston St. Louis San Francisco New Orleans Montreal Washington